Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

AMERICAN DYESTUFF REPORTER

AUGUST 9, 1948
VOLUME 37, No. 16

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

NEW
ANTHRAQUINONE
BLUE R A (Pat.)

For woolen and worsted piece goods and carpet stocks . . . used as a self shade or as a shading element for browns, tans and purples. Level dyeing, excellent solubility, good penetration. Effect threads of cotton, acetate and viscose-process rayon are only slightly tinted.

Where fastness to light, dry cleaning or perspiration is important, Du Pont Anthraquinone Blue RA is especially recommended. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Div., Wilmington 98, Del.

Du Pont Dyestuffs

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

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ANIONIC SUBSTANTIVE SOFTENER FOR CELLULOSIC FABRICS

- Will not oxidize on fabric to cause discoloration or rancidity
- May be exhausted onto cellulosic fabrics from a dilute solution
- Finish shows high degree of resistance to laundering
- Compatible with other anionic finishes and with alkaline materials
- Will not discolor white goods or develop undesirable odors after ageing and pressing
- Has no adverse effect on light-fastness of dyes
- Soluble in warm or hot water

Warwick Technical advisors, with their wide knowledge of textile chemicals and processes, are available for consultation.

WARWICK CHEMICAL COMPANY, Division of **SUN CHEMICAL CORP.,** 10-10 44th Ave., Long Island City, N. Y.

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in sulphur colors, the first and foremost brand names are

KATIGEN
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PRODUCTS OF THE GENERAL DYESTUFF CORPORATION

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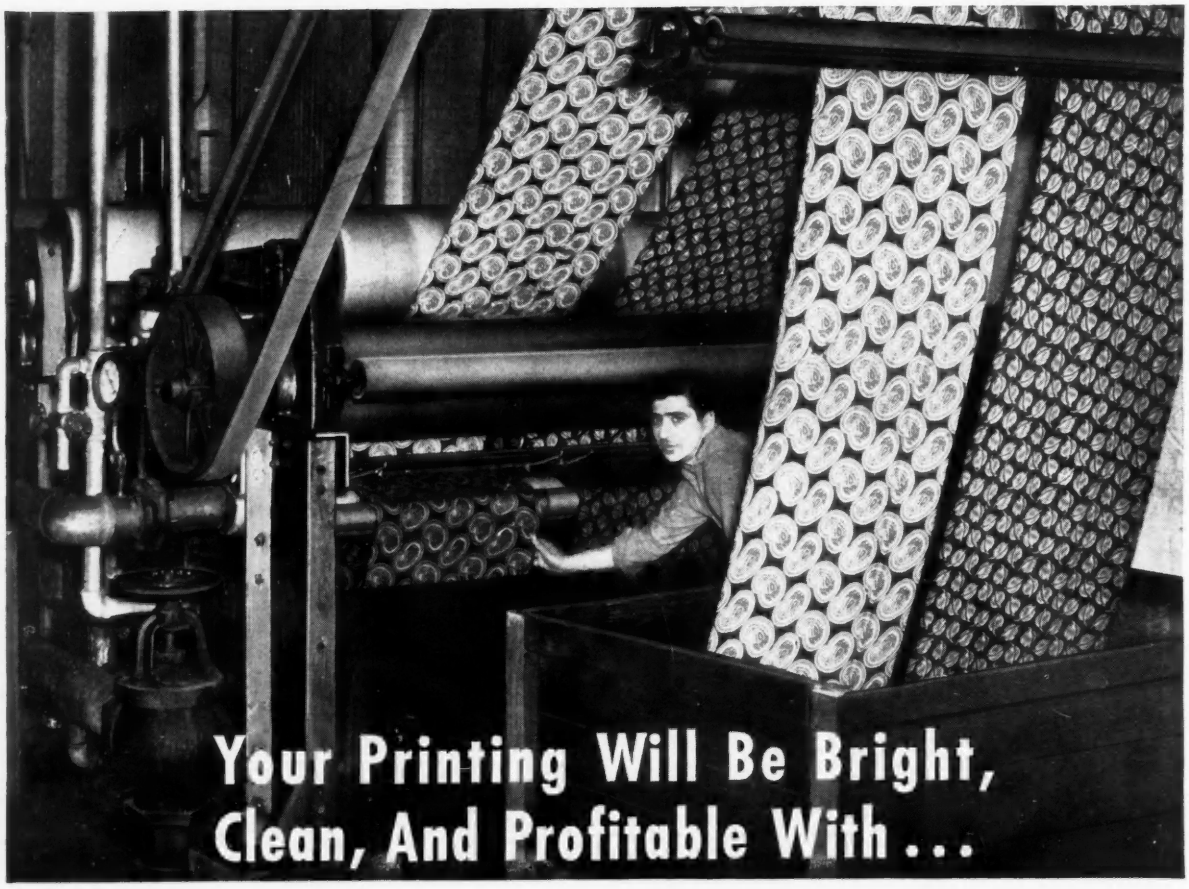
GENERAL DYESTUFF CORPORATION
435 HUDSON STREET, NEW YORK 14, N. Y.



ORATOL L-48

The problem in the print wash operation is to remove excess pigment and paste constituents, *quickly* . . . to brighten and liven colors . . . with no waste of time or added expense.

Oratol L-48 has high foaming, emulsifying, and wetting properties . . . requisites in the rinsing process. Its powerful detergency and rapid scouring action greatly reduces any tendency toward bleeding. Oratol L-48 is stable in hard water and performs equally well on all types of fibres — under acid or alkaline conditions.

What this means to you:

1. Quick, effective rinsing
2. Brighter, livelier shades
3. Fewer rejects
4. Greater output . . . greater profit

Oratol L-48 has other important advantages; only a very small quantity is required when used alone as a print wash. If used in conjunction with soap, it increases the stability of the soap and prevents formation of soap curds. Oratol requires less water, rinses rapidly, and leaves the fabric with improved hand.

Ask our representative for full details about economical Oratol L-48. Or write today for technical data and your generous free sample for testing.

A Feature to Remember!

ORATOL L-48 Gives Brighter Cleaner Shades

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Plants: Passaic, Carlstadt, N. J.; Los Angeles, Calif.

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WOLF BRAND PRODUCTS

JACQUES WOLF & CO. *Chemicals* PASSAIC, N. J.

American Dyestuff Reporter, Vol. 37, No. 16, August 9, 1948. Published every other Monday. Copyright, 1948, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

ANOTHER NACCONOL NR APPLICATION

Here's a Hot Tip: Use Wetter Water on Fires

So you think water is wet? Hah! Such old-fashioned ideas. The National Aniline Division has got something that is so wet it will give water a soaking. It's called Nacconol, a handy little chemical which can do to water what whisky will do to soda. Make it penetrating, that is.

Nacconol was given a brisk workout yesterday in a special demonstration at the foot of Court St.

A group of student firemen under the direction of George A. Leo, superintendent of fire apparatus, and Dr. O. M. Morgan of National Aniline lighted piles of old furniture and straw.

Then they sprayed the fire with water, just to show they haven't lost touch with the traditions of the past. The fire went out. But, and this is important, it smoldered. Another pile was set on fire.

This time the fire-fighters were using water wetted with Nacconol. The fire gave a half-hearted hiss and quit. It didn't even smolder as was the wont of the fires of yesteryear.

Nacconol, explained Leo and Dr. Morgan, goes right after Class A blazes. It gives water a quality of penetration which enables it to get right down in the pores where it can do battle with the flames readily.

So there it is. Next time you feel blue about getting soaked in the rain, think of Nacconol and feel good again.

BUFFALO COURIER-EXPRESS

⅛% NACCONOL *Solution*

Wets 3 Times Faster!

For any wetting or washing operation, remember

NACCONOL* NR

AMERICA'S LEADING SYNTHETIC DETERGENT

COSTS LESS THAN SOAP — DOES MORE THAN SOAP

WASHES • WETS • FOAMS • DISPERSES
EMULSIFIES *AT ONE LOW COST*

Let us show you how much NACCONOL NR can save you

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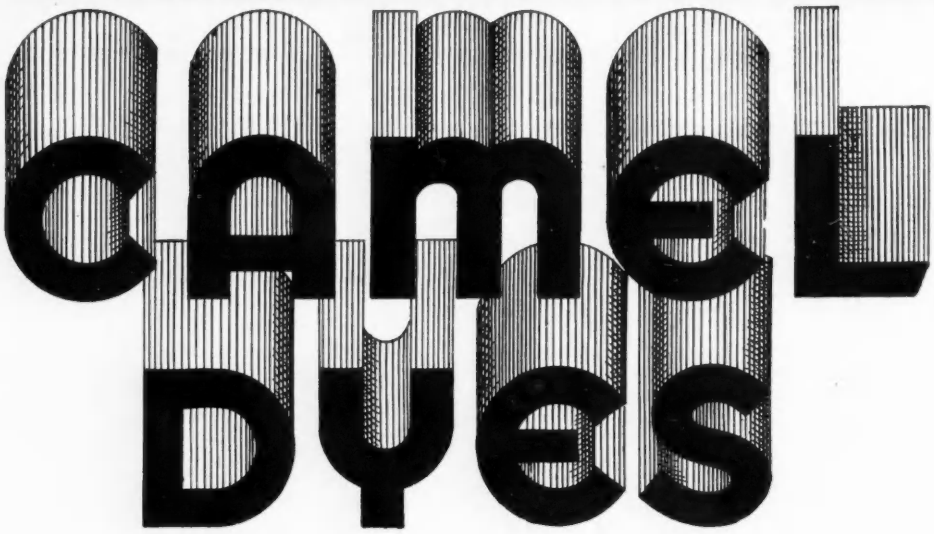

THE CAMEL LINE OF
DEPENDABLE DYESTUFFS
has served the textile mills of America without interruption since 1876.

This broad experience assures
PROMPT • EFFICIENT • ECONOMICAL SERVICE
TO MEET ALL DYESTUFF REQUIREMENTS

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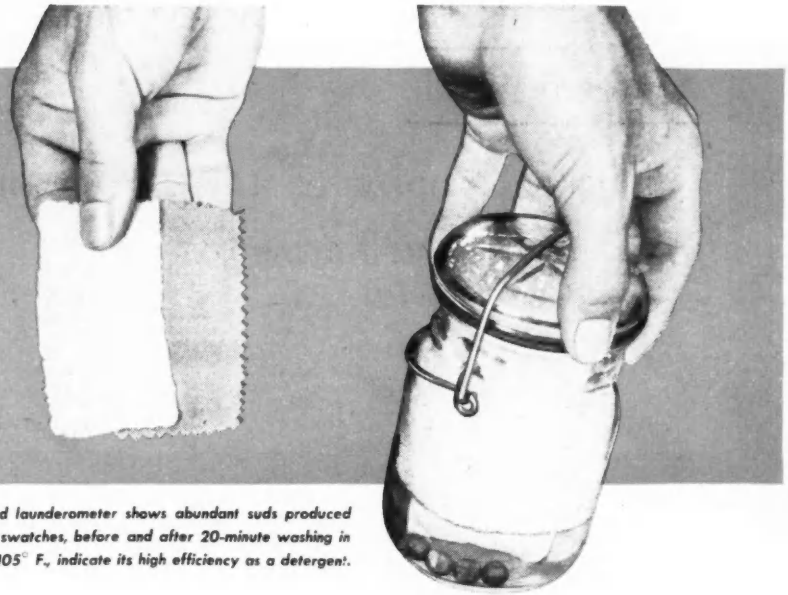
ATLANTIC PETROLEUM CHEMICALS

ULTRAWET K's

CAN A SYNTHETIC DETERGENT GIVE YOU DEPENDABLE SUDSING?



Test jar from standard launderometer shows abundant suds produced by Ultrawet K. Wool swatches, before and after 20-minute washing in 100 p.p.m. water at 105° F., indicate its high efficiency as a detergent.

THE answer is "Yes!" when the detergent is one of Atlantic's new K series Ultrawets. In production the sudsing properties of these alkyl aryl surface-active agents are checked constantly. They must meet standards just as rigid as those for detergency.

Superior sudsing, cleaning and wetting properties recommend the new Ultrawet K's for better detergents, cleaning compounds, cosmetics and many industrial processes.

They are available in three convenient forms — liquid, flakes, beads.

Atlantic Ultrawet K's are produced by an organization that has been making detergents and wetting agents for over 10 years. They are backed by Atlantic's great research organization. The data below indicate their outstanding quality.

TYPICAL PROPERTIES
(in 100 p.p.m. water)

Surface Tension @ .05% . . . . . 27.3 dynes-cm.
Draves Wetting Time @ .1% . . . . 8.2 seconds
Ross-Miles Foam Test @ .05% . . 116 mm.

For samples, further information and quotations, wire or write

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A.A.T.C.C. CONVENTION ISSUE

All advertising copy for the A.A.T.C.C. Convention issue, dated October 18th, must be in our hands by September 20th.

Additional copies of this important issue will be printed for distribution at the...

AATCC

NATIONAL MEETING
AND
CONVENTION
AUGUSTA, GEORGIA
OCTOBER 21-23
1948

NOTE IMPORTANT FEATURES OF THIS ISSUE ON OPPOSITE PAGE

- Complete Program of the AATCC Convention
- Abstracts of All Technical Papers
- Consolidated History of the Southern Sections
- The Convention City — Points of Interest and Significant Facts
- Other Timely Articles

AMERICAN DYESTUFF REPORTER

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You cannot afford to pile by hand

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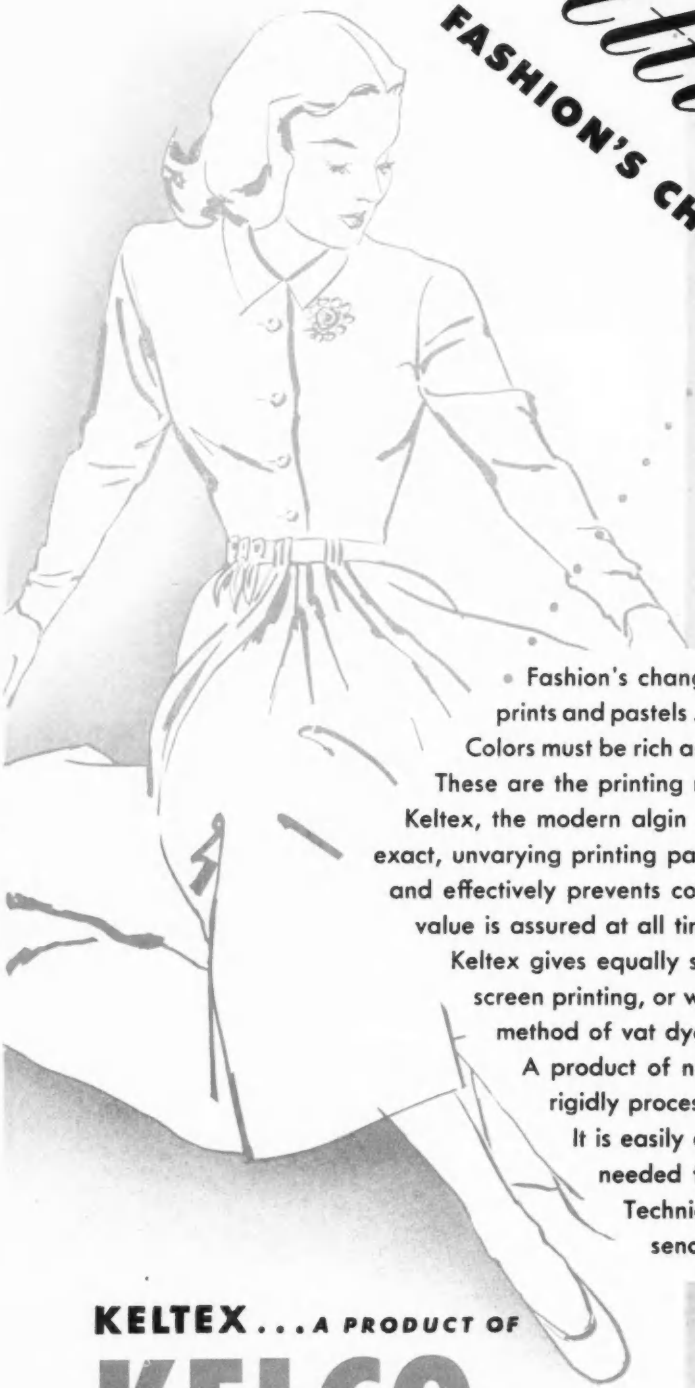
ENGINEERS AND MANUFACTURERS

HOLYOKE • • • MASSACHUSETTS

Attuned TO FASHION'S CHANGING MOOD



Fashion's changing mood calls for new, exciting prints and pastels . . . keyed to the styling of the New Look. Colors must be rich and brilliant; patterns sharp and clear. These are the printing results you get when you use Keltex, the modern algin thickening agent. Keltex provides exact, unvarying printing paste viscosity — superior penetration — and effectively prevents color migration. True, even color value is assured at all times.

Keltex gives equally superior results in machine and screen printing, or when used in the pad pigment method of vat dyeing.

A product of nature, Keltex is super-refined and rigidly processed for consistent uniformity. It is easily applied and only a light wash is needed for complete removal. Our Technical Department will be pleased to send you full information on request.

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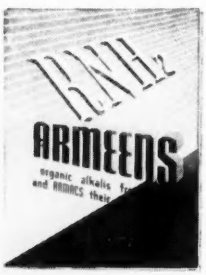
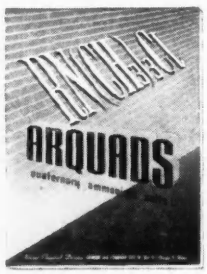


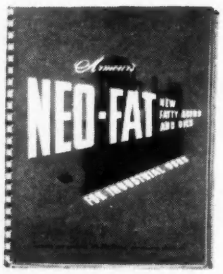
NAME: ARMEENS

Also known as aliphatic amines—and their partners the Armacs (amine acetate salts). Wanted as: cationic emulsifiers, detergents, germicides, rodenticides, mildew resistants, fire-retardants, penetrants, water-repellents. For more information write for booklet "RNH_2... Armeens and Armacs."



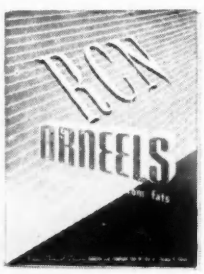
NAME: ARQUADS

Also referred to as Armour's alkyl trimethyl ammonium chloride compounds. Wanted for these indicated uses: cationic softeners for rayons, synthetic fibers and resin-treated fibers; germicides; cationic emulsifying agents; algae controllers. You'll also want the booklet "$RN(CH_3)_2Cl$... Arquads".



NAME: NEO-FATS

These pure fatty acids, made possible by Armour's patented fractional distillation process, are wanted as: starting materials for synthetic detergents, resin coatings, emulsifiers, wetting agents, water-repellents, softeners, lubricants. Send today for the helpful booklet "Neo-Fats".



NAME: ARNEELS

Also called Armour's aliphatic nitriles. Wanted for: softeners, rodent-repellents, lubricants, water-repellents, intermediates for specialty textile chemicals. Get instructive help from valuable booklet "RCN . . . Arneels".

NAME: ARMIDS

Alias Armour's aliphatic amides. Wanted for following textile applications: finishing waxes, coating resin ingredients, water-repellents, plastic anti-blocks. For detailed information write for booklet "$RCONH_2$ . . . Armids".

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AMANTHRENE* VAT COLORS
provide the answer to the demand for
better color fastness in textiles

Amanthrene

DARK BLUE BO

in paste or powder form

A deep, full toned Navy of reddish cast . . .
well suited to the fast coloring of cottons and rayons
by any of the vat application processes.

Especially recommended for printing and dyeing quality fabrics
when the cardinal call is for effective resistance
to light, washing, peroxide bleach and chlorine.

Another of the Amanthrene range of superior vat colors.
For detailed information on the whole range available,
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happy to be of service.

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for scouring all types of fabrics, woolens, cottons, rayons, and all knitted fabrics, including hosiery

DERGON O M IS A HIGHLY EFFICIENT DETERGENT AND A POWERFUL OIL EMULSIFIER

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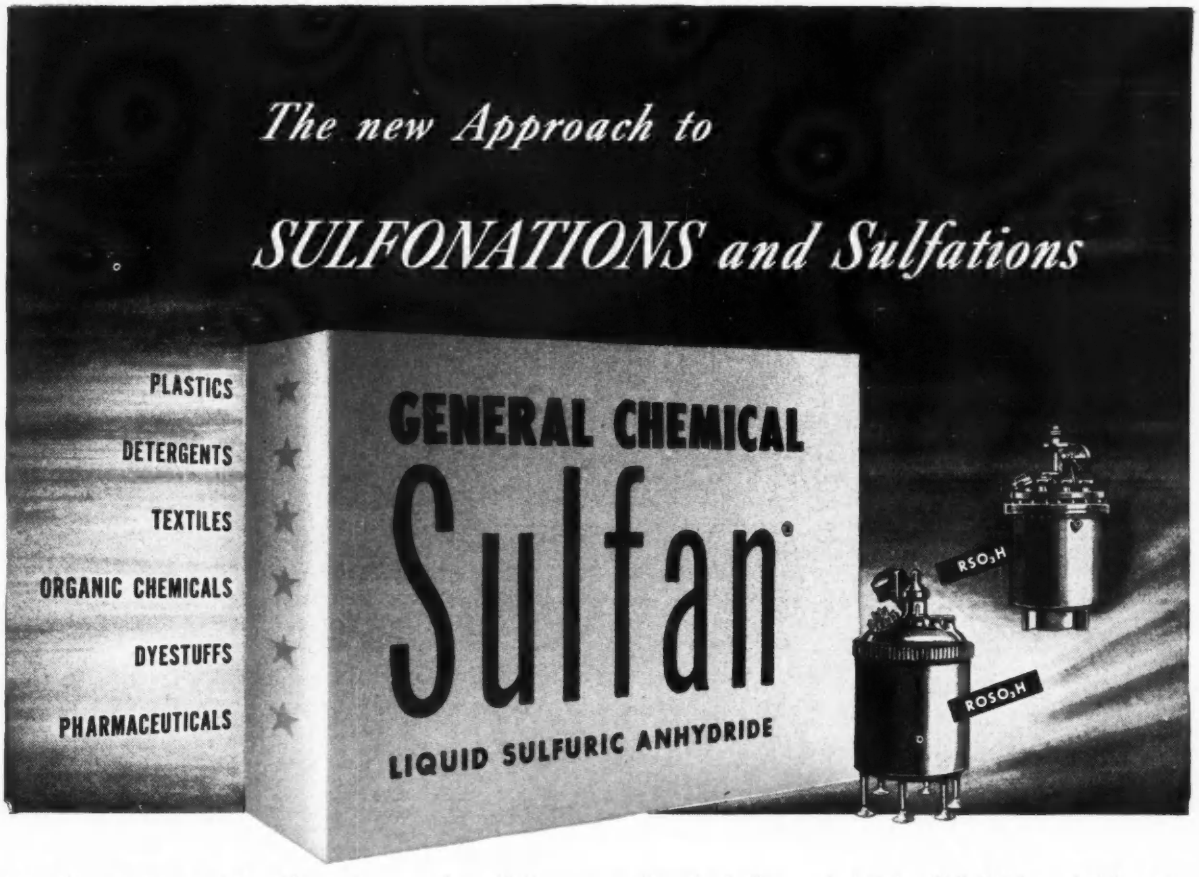

Less than twelve months ago General Chemical Research introduced SULFAN—Stabilized Sulfuric Anhydride—to the Process Industries. Even in that short space of time, many using SULFAN have predicted it may well "rewrite the book on sulfonation and sulfation!"

Important among the many reasons for this belief is the fact that SULFAN provides Sulfur Trioxide in stable, easy-to-use liquid form for the first time in chemical history.

In sulfations as well as in both mono- and poly-sulfonations, it offers multiple advantages:

- Eliminates costly, time-consuming neutralization and washing steps.
- Shortens processing time.
- Produces salt-free products.
- Obviates waste acid disposal.

Already finding a place in the textile, dyestuff, detergent, pharmaceutical, plastics and general organic chemical industries, SULFAN may hold a rich potential for your operations, too. Write for samples or commercial quantities.

Special Technical Literature

Available on request on business letterhead.

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Reactions of SO_3—Comprehensive, selected abstracts and bibliography compiled by General Chemical Research.

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FOR AMERICAN INDUSTRY

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Important to many processes as intermediates and solvents in the production of Pharmaceuticals, Dyes, Fungicides and Organic Chemicals.

CH_2Cl	$COCl$	CCl_3
BENZYL CHLORIDE	**BENZOYL CHLORIDE**	**BENZO-TRICHLORIDE**
Chlorinated Benzaldehydes	Chlorinated Benzotrichlorides	Chlorinated Benzyl Chlorides
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Ortho and Para chloro, 2,4 and 3,4 Dichloro, as well as several higher chlorinated derivatives, are also available.

Technical literature covering properties, specifications and shipping details will be mailed promptly on request.

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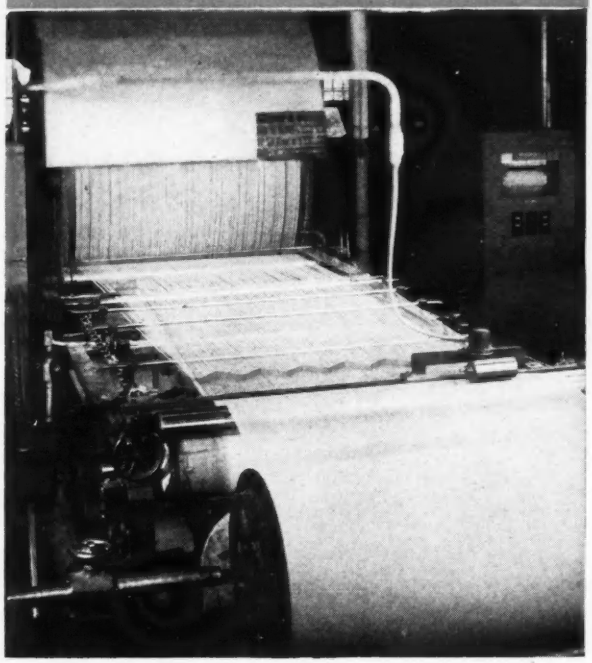
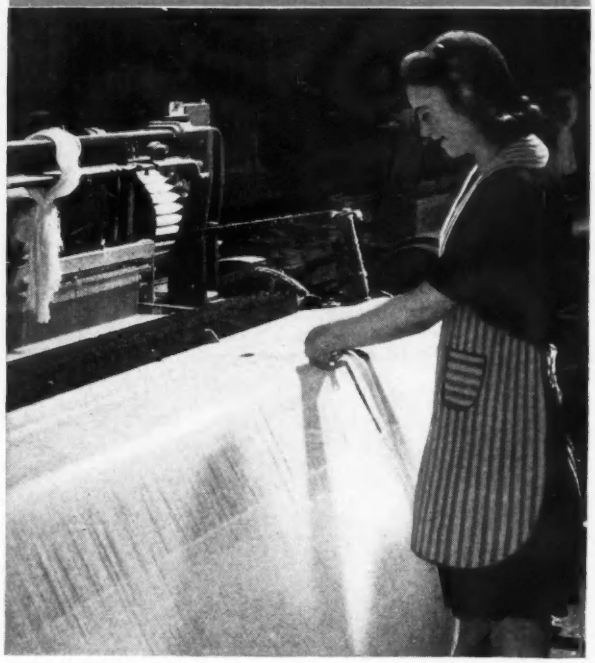
Less Sticking on Slasher Drums



Reduced Breakage in Weaving



New S/V Weavrex 200

Gives Improved Results in Weaving Cotton Cloths

★ ***Easily Removed in De-sizing Operations*** ★

Proved highly successful in extensive tests by leading textile mills, a new Socony-Vacuum product . . . S/V Weavrex 200 . . . is now available for use in making up warp sizing mixtures.

Outstanding among its advantages is a pronounced reduction of the common tendency of sized yarns to stick to the drying cylinder of the slasher.

Tests also show high weaving efficiency and less shedding.

The new oil is thoroughly compatible with fast and slow boiling starches, gums, binders and other materials used in sizing yarns. It has no objectionable or rancid odor; and is light stable. It has desirable wetting properties, and is easily removed in de-sizing operations—a feature that means considerable savings in time and expense.

Added to these advantages, is its moderate cost. Ask your Socony-Vacuum Representative for recommendations for use in your particular warp-sizing applications.

SOCONY-VACUUM OIL COMPANY, INC.
26 Broadway, New York 4, N. Y., and Affiliates:
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Better Processing for ALL Textiles

Woolens . . . S/V Woolrex Oils improve carding and spinning. Scour out easily.

Worsteds . . . S/V Worstex Oils lubricate stock uniformly. Improve spinning.

Water Repellents . . . S/V Products give maximum repellency with minimum amounts.

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Rayon Processing . . . S/V Rayon Oils add softness to rayon fibers.

Socony-Vacuum Process Products

Process Products

SYTON FOR WOOLEN SPINNING

Patented June 15, 1948 **2,443,512**

UNITED STATES PATENT OFFICE

2,443,512

TREATMENT OF TEXTILE FIBERS

The present invention is based on the discovery that by treating textile fibers with certain sols or colloidal solutions of silica, it is possible to reduce markedly the slippage normally present in fibers, and as a result to speed up the rate of spinning and greatly increase the tensile strength of the resulting yarn

In general, the invention is carried out by applying the silica sol to the fibers in any desired manner.

By following the methods of this invention, it is possible to produce from treated or slip resistant fibers, yarns having the same or greater tensile strength than the untreated yarn even though the number of turns per inch of the treated yarn is substantially less than the number of turns per inch required to give maximum strength to the untreated yarn.

This increase in tensile strength of yarns or fabrics, prepared from fibers treated in accordance with our invention, can also be obtained in the case of yarns or fabrics made of animal, vegetable and synthetic fibers, or mixtures thereof of the types hereinbefore described.

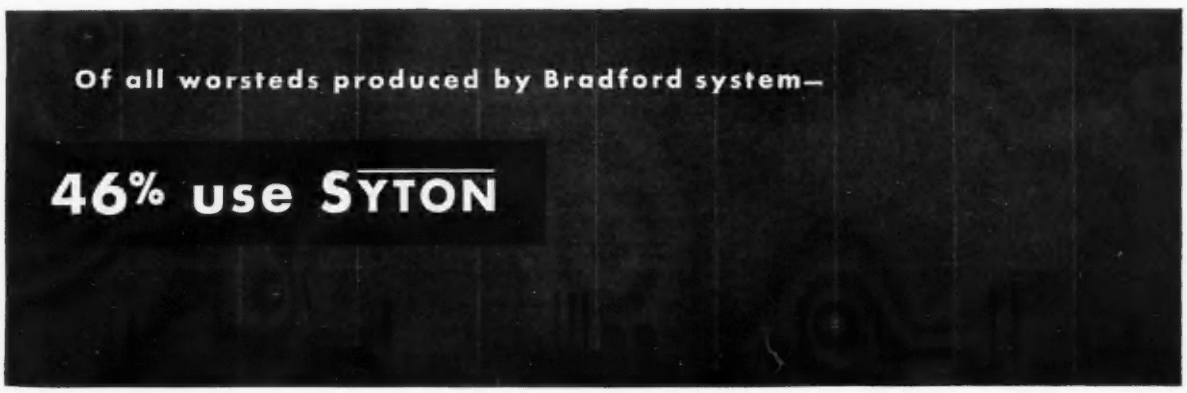
The sols described herein may be applied to the fibers by spraying, immersion, wiping or the like.

What is claimed is:

1. The method of treating unspun textile fibers to increase their slip resistance and prepare them for spinning which comprises applying to said fibers at some stage of their processing prior to spinning a colloidal aqueous solution of silica consisting of silica sol

Monsanto's position as pioneer and leader in this important development is confirmed by U. S. Pat. No. 2,443,512, excerpts from which are shown above.

...PROVED BY THE MILLS!



54 more woolen mills have adopted Syton in the last four months. 46% of all the worsted yarn spun on Bradford system is spun with Syton.

In these mills . . . and in more every week . . . Syton is standard material for better spinning at lower cost.

Mills confirm these five Syton advantages:

- **Increased Production.**
- **Loftier Yarns.**
- **Fewer Ends Down.**
- **Better Spinning Efficiency.**
- **Finer Yarns Possible.**

Monsanto research originated Syton to control and reduce fiber slippage caused by lubrication during early processing. The result: Every grade of woolen fiber is more profitable to handle because Syton makes it easier to spin. Lower grades, too.

Syton is a good answer to the American Wool Council statement: "One of the major problems of the wool industry is to make better use of lower grades of wool."

Your mill can take advantage of the hundreds of profitable lessons learned with Syton in actual mill practice. Monsanto can give you complete information, plus on-the-spot technical help. Just send the handy coupon.

Syton: Reg. U. S. Pat. Off.

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☐ Please send information on Syton for spinning.

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Company _____

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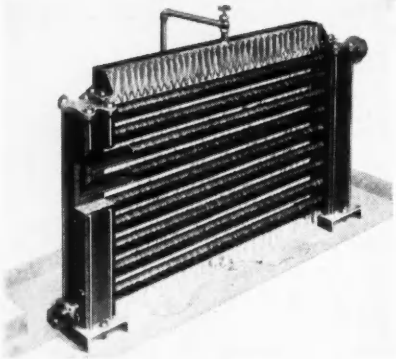
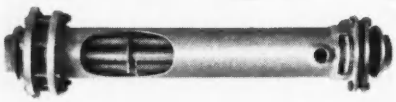
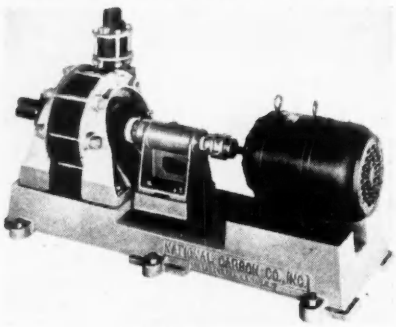


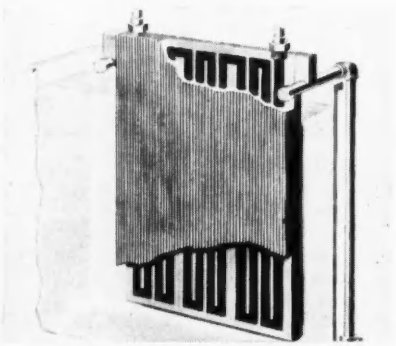
"Karbate" Sectional Cascade Cooler



"Karbate" Series 70 Heat Exchanger



"Karbate" Pump



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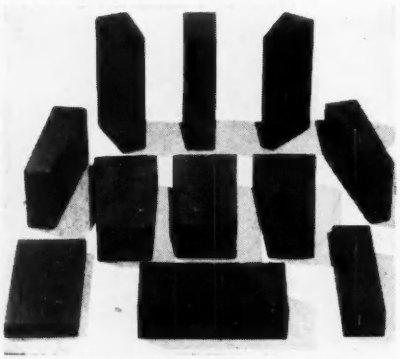

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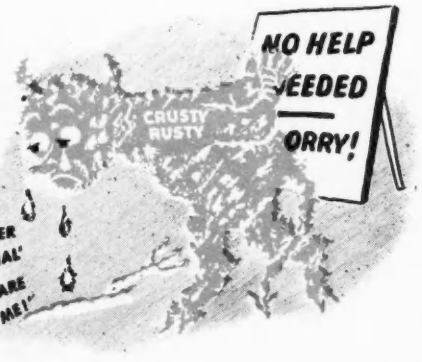

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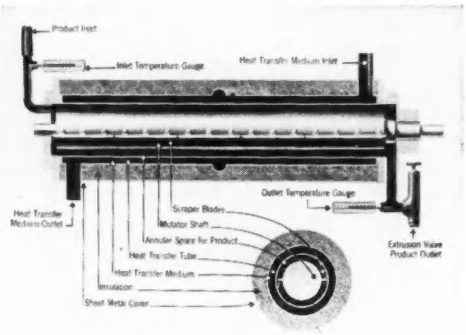

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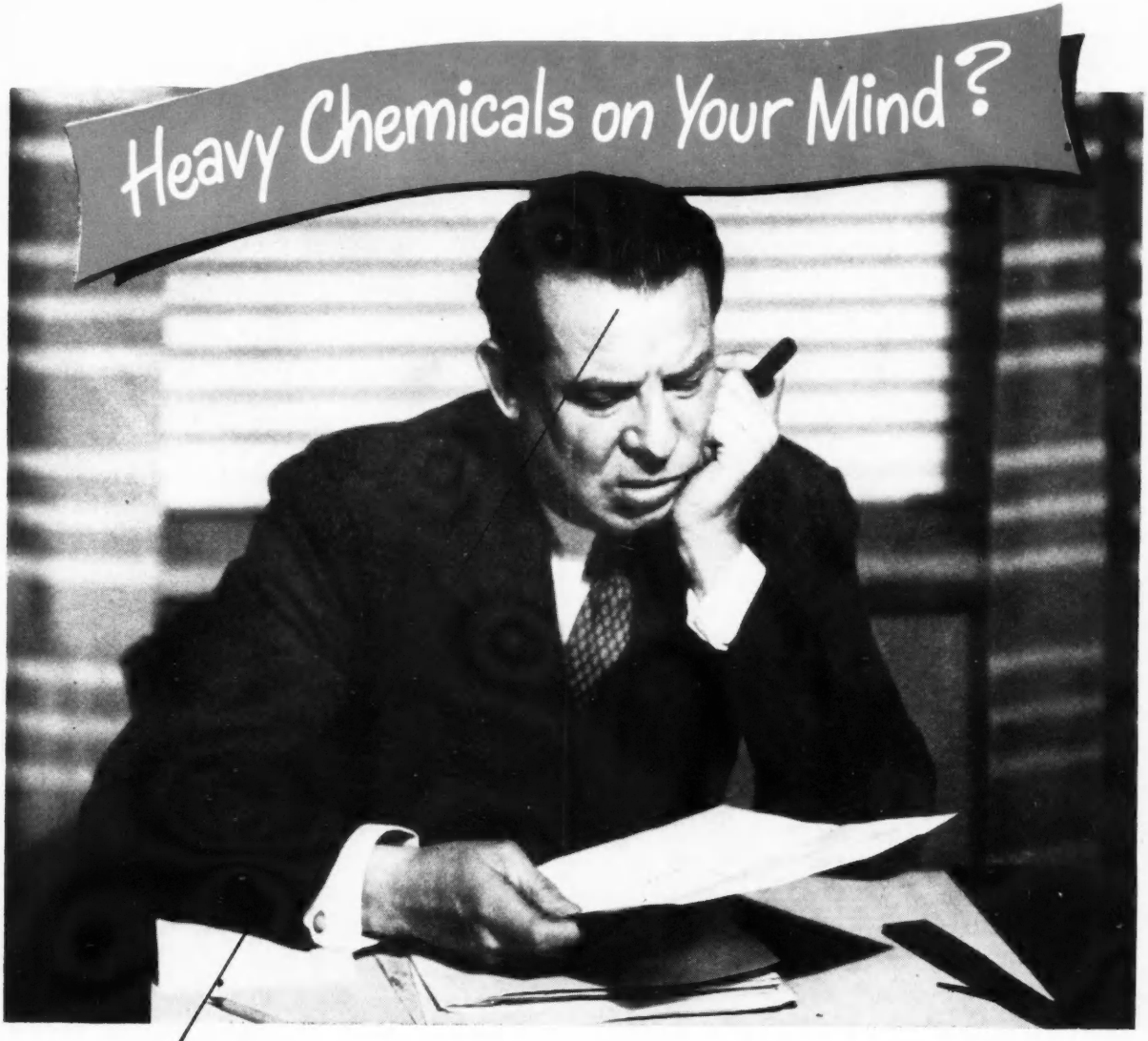

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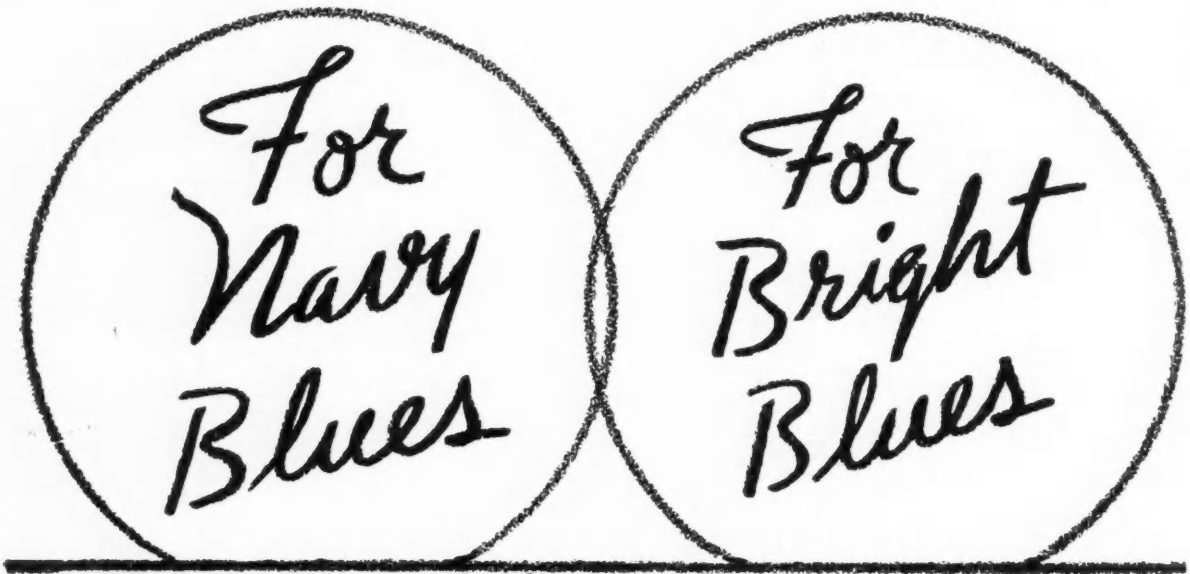

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August 9, 1948

VOLUME 37 NUMBER 16

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VOLUME 37 AUGUST 9, 1948 NUMBER 16

Improved Evaluation of the Crease Resistance of Resin Treated Fabrics

R. D. DeWAARD, A. HVIZDAK and C. R. STOCK

Stamford Research Laboratories

American Cyanamid Company

Introduction

THE ability of a fabric to recover from a crease depends largely on its resilience, a factor associated with the elasticity of the fiber. Woolen goods owe much of their resistance to wrinkling to the natural elasticity of wool fibers; conversely, for cotton and rayon, where natural elasticity is poorer, wrinkling is more evident. It can be reduced for the latter materials if resilience is increased by treatment with certain finishes. For some twenty years various chemical and synthetic resin finishes have therefore been used to improve cotton and rayon fabrics in this respect.

The main purpose of this investigation was to develop a test and the apparatus for evaluating the crease resisting properties of melamine resin finishes easily yet precisely. Two instruments were constructed, in some respects novel, in others borrowing from the earlier art of the well known T.B.L. *(1)* and similar tests. Several of the factors involved in crease resistance testing were surveyed with the first apparatus, avoiding some defects of the T.B.L. test. The second apparatus arose from the data supplied by the first, and provides a precision device for studying routinely the merits of finishes for reducing wrinkling.

Data furnished by the first instrument examine the validity of laboratory tests in predicting practical utility of finishing treatments. Thus the effect of long loading times often encountered in use was studied as compared to short loading periods usually employed in laboratory testing. The utility of the second apparatus is illustrated toward the end of this article.

Crease Resistance Testing

Many methods have been devised to measure crease resistance. Qualitative procedures have been reviewed by Fourt *(2)*, wherein the amount of wrinkling of swatches is estimated visually. The oldest, and possibly most widely used quantitative method was originated by the Tootal Broadhurst Lee Co., *(1)* (T.B.L. test). This comprises folding a rectangular specimen across its narrow dimension, placing it under a weight for a period of time, then allowing it to recover while hung at the crease over a horizontal wire. The crease is described in terms of the distance between the ends of the partly recovered specimen. Other similar tests *(3) (4) (5)* measure either the angle of the crease, or the distance between the free ends of the folded specimen.

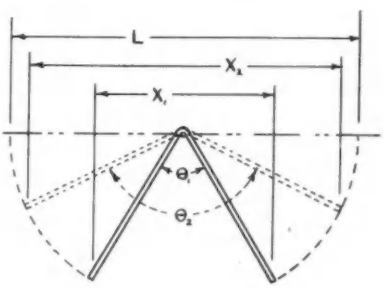
A more thoroughgoing approach is to measure a quality related to resilience, by procedures such as those described by Schiefer *(6)*, by a complete survey of the flexural load-deformation characteristics of the material. This was considered too time consuming for routine testing and, moreover, provided more information than was required by our problem. Because wrinkling appears to be most important for lightweight fabrics, where the pressures usually are ample to form a flat crease, these conditions were employed in the test procedures used here.

Requirements for a Suitable Test

The limitations of the T.B.L. test for making measurements of sufficient precision, and possible remedies to the situation, are considered below.

Since a control test should not only be simple and fast but, for the development of new finishes, also sufficiently precise to follow small improvements, description in terms of the angle included in the crease appears superior to that of the projected length of the specimen. Some of the defects inherent in the latter are:—

(1) *Variable Sensitivity*—The distance between the ends of a creased specimen depends on the sine of the crease angle. (Fig. 1). For small angles, (Θ_1) (materials with poor crease resistance) small differences in the angle will give readable differences in the distance between the ends, but for larger angles (Θ_2) (materials with good crease resistance) similar angular differences will not be detected by such a measurement.



$$X_1 = L \sin \frac{\Theta_1}{2}$$

$$X_2 = L \sin \frac{\Theta_2}{2}$$

Fig. 1. Illustration of relative insensitivity of projected length measurement at large angles. Equal small increments in the crease angle are more precisely determined at distance X_1, than at X_2.

(2) *Curvature of Specimen*—In Figure 1 a specimen with straight legs was shown. Another error results from curvature caused by the weight of the hanging ends and residual deformation in the cloth. The amount depends upon the length, distributed weight and stiffness of the specimen. Of these only the length can be adjusted to improve measurement.

(3) *Twist*—Twist produces error by making it difficult for the operator to estimate the projected length accurately. This effect is mostly produced by stresses introduced during spinning and weaving *(7)*, and is particularly prevalent with a twill weave fabric.

(4) *Manipulation*—A final source of error results from any handling of the specimen before measurements are taken. This obviously applies whether the projected length or the angle is measured.

Examination of wrinkled cloth makes it evident that the eye detects and estimates the severity of wrinkling in terms of light and shadow patterns and that these patterns become more noticeable as the angle of the crease, *measured at the apex*, becomes more acute. This effect has been illustrated in Figure 2 by milling shallow V-shaped grooves into the surface of two aluminum plates. Both plates have the same gross angles (120 deg.), but the one on the left has been further machined so that the apex angles are 20 degrees larger. Both were then sprayed with a flat white paint. The left-hand template, having the more obtuse apex angles, appears less "wrinkled".

Measuring crease resistance by the apex angle also eliminates the defect of variable sensitivity and substantially reduces those of curvature and twist. A technique of defining the angle by the tangent near the apex has therefore been adopted. Manipulation can be minimized by an instrument in which handling between creasing and measuring is eliminated.

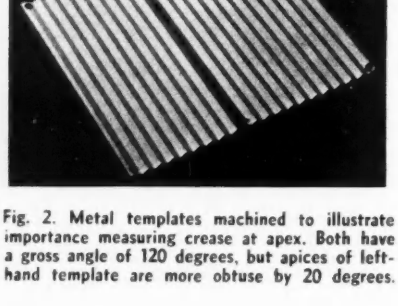


Fig. 2. Metal templates machined to illustrate importance measuring crease at apex. Both have a gross angle of 120 degrees, but apices of left-hand template are more obtuse by 20 degrees.

In use, where wrinkling of cloth is caused by its being folded and sat upon, the fold may be under an unknown amount of pressure continuously for several hours before being released and allowed to recover. Creasing and recovery times of a few minutes, as well as a single arbitrary pressure, used in most laboratory tests, may not be sufficient to reflect usage performance of textiles. These relationships must be established so that laboratory data can give assistance in developing crease resisting finishes that will perform adequately under the expected conditions of use.

Experimental

APPARATUS AND OPTIMUM CONDITIONS OF USE.—Two instruments were constructed and used to obtain the data reported in this paper. The first was designed to investigate the factors just mentioned, as well as to find the most suitable length of specimen for these tests. This has been called the "Vise Pressure" instrument. Its essential characteristics are shown in Figures 3 and 4 and outlined below:—

1. A freely sliding jaw closes flush against a fixed jaw to crease the specimens.

2. Pressure between the vise faces is applied by means of a lever arm and a weight (W). A simple tool for inserting the specimens between the jaws in a reproducible manner insures pressing a definite area of cloth at the crease.

3. After a specimen has been creased for the prescribed time the vise is opened, allowing the sample to drop onto a thin fence of shim steel.

4. Substantially parallel light, directed parallel to the edge of the specimen, throws a silhouette of the sample on a translucent screen, upon which is inscribed a diametrical line (Figure 4). The screen can be rotated freely within a circular dial calibrated in degrees. A taut cross-hair located diametrically across the dial casts a line-shadow on the screen. The two lines so formed intersect at the center of the screen, providing an accurate method of measuring the angle formed by the sample at the apex. The precision of measurement has been estimated as plus or minus one degree, which for most materials results in an error of 1 or 2 per cent.

The silhouette avoids the parallax that hinders accuracy when direct viewing methods are used. When measuring the angle of twisted samples, such as twills, no accuracy is sacrificed if the measurement is

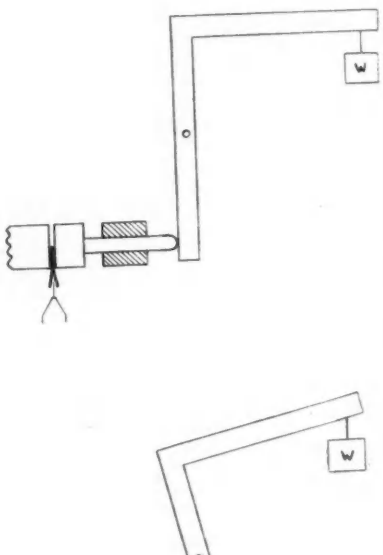


Fig. 3. "Vise Pressure" assembly used to impart crease to test specimen. The upper figure shows a sample being creased, the lower after it has dropped onto the fence provided.

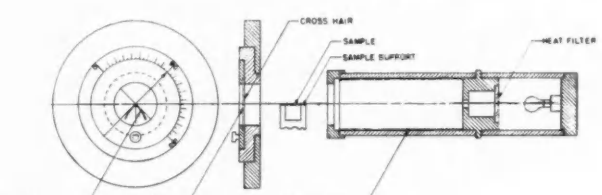


Fig. 4. Method of measuring the angle of crease of the specimen.

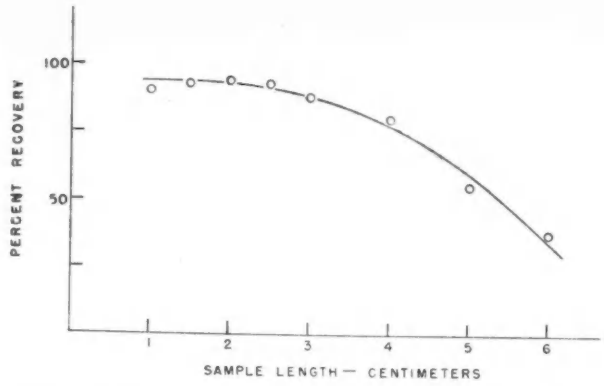


Fig. 5. Effect of sample length upon recovery as measured by the end-to-end distance. The material is spun rayon.

properly made. The legs are not sensibly displaced near the apex in twisted samples, so that location of one line tangent at the outside edge of the one leg and the second line at the inside edge of the other leg yields the correct angle.

Preliminary experiments with this arrangement were first undertaken to find the best values for (a) length of sample, (b) creasing time, (c) relaxation time, (d) creasing pressure.

As described later on, in addition to the standard textile conditions of 70° F. and 65% R.H., 98° F and 93% R.H. were chosen to examine crease resisting finishes at conditions approximating those encountered by clothing in use in humid summer weather. Therefore it was necessary to find the influence of these conditions on several of the above factors. The humid tests were conducted in a small heated and humidified cabinet.

SAMPLE LENGTH.—Since the length, weight and stiffness of the hanging ends determine their shape *(8)*, an optimum length should be found which will minimize curvature but not be so short as to make manipulation difficult. Because the effect of curvature is obviously more pronounced in projected length than in angle measurements, the former method was chosen to determine a suitable length as well as to examine the possible error in the T.B.L. test.

Rayon was used in this study because it has been observed to droop more than cotton materials of similar construction. Samples one centimeter wide, of spun rayon fabric were tested in lengths varying from one to six centimeters, applying at the fold a calculated pressure of one kg. per sq. cm. The results in Figure 5, where the ordinate represents recovery in percentage of the flat length, show that for strips of approximately 3 centimeters or less measurements are practically independent of specimen length. Data (not shown) for crease angle versus length also indicate the advantage of the short specimen, although the effect is less pronounced. All tests described in the following experiments therefore make use of specimens 3 centimeters in length. Although softer textiles might show the need for an even shorter specimen, further reduction in length was found to make manipulation a painstaking operation.

CREASING TIME.—To determine the effect of varying the creasing time, the vise apparatus was employed at one kg. per sq. cm. and the apex angle was examined after intervals of ¼, 5, 30 and 60 minutes. All tests were conducted at 98° F. and 93% R.H.* The specimens were permitted to recover for 30 minutes before measurements were taken. Five specimens of each material were tested at each creasing time, all being cut with the filling threads lengthwise of the specimens.

Figure 6 shows the data for mercerized cotton twill (36 inch, 108 by 56, 3 yds./lb.), untreated and treated with a melamine resin, Figure 7 for untreated and resin treated spun viscose gabardine (36 inch, 76 by 78, 2.4 yds./lb.). Both of these graphs illustrate that prolonged periods of creasing, although producing more severe creasing, do not substantially alter the measured gain in crease resistance as affected by the resin finish on a given cloth. The approximate parallelism of the curves demonstrates this, besides illustrating that the proportional benefit derived from treatment increases with creasing time. This study implies that long periods of creasing are not necessary; at least for the fabrics and treatments considered here, a short creasing period provides as much information. The same

* The effects of duration of creasing pressure are more pronounced at these conditions than at standard textile testing conditions.

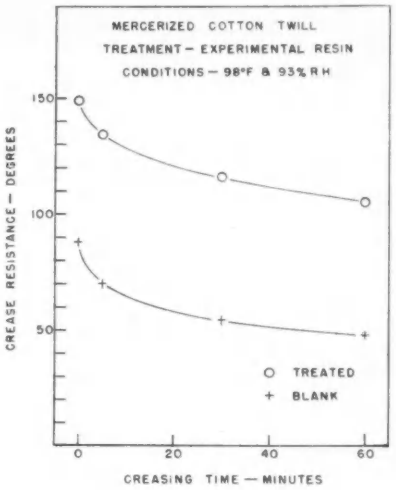


Fig. 6. Effect of time of creasing upon measurement of crease resistance. Tests performed by Vise Pressure method on untreated and resin treated mercerized cotton twill.

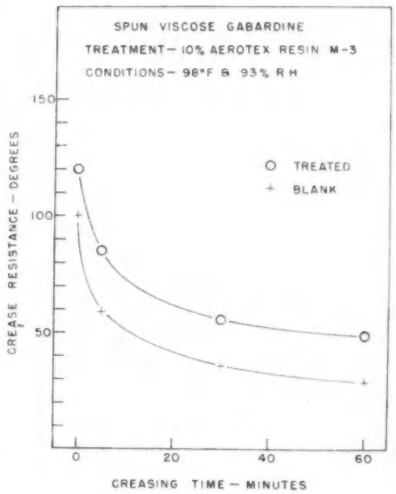


Fig. 7. Effect of time of creasing upon measurement of crease-resistance. Tests performed by Vise Pressure method on untreated and resin treated spun viscose gabardine.

cannot be said, however, when comparing different cloths. The lower (untreated) curves of Figures 6 and 7 show the gabardine less creased than the twill after ¼ minute, but considerably more so for the longer times.

RELAXATION TIME.—After pressure has been removed, a specimen must be permitted a certain recovery period before the "permanent" crease can be reliably measured. The relaxation period after which equilibrium may be assumed

to exist was studied, using the same fabrics and employing a creasing time of 5 minutes, at 1 kg. per sq. cm.

The results at standard conditions shown in Figure 8 for untreated and resin treated cotton and rayon indicate that a recovery period of 10 to 15 minutes assures substantially complete relaxation. Generally similar recovery periods were also found necessary at 98° F. and 93% R.H.

CREASING PRESSURE.—The study of crease resistance as a function of creasing pressure was carried out on the same materials and resin treatments employed

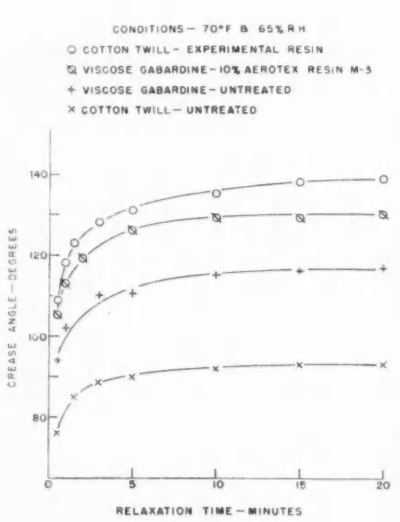

CONDITIONS – 70°F & 65% R.H.
○ COTTON TWILL – EXPERIMENTAL RESIN
⊠ VISCOSE GABARDINE – 10% AEROTEX RESIN M-3
+ VISCOSE GABARDINE – UNTREATED
× COTTON TWILL – UNTREATED
CREASE ANGLE – DEGREES
RELAXATION TIME – MINUTES

Fig. 8. Recovery after creasing of cotton and rayon cloth, untreated and resin finished. Tested with Vise Pressure instrument at standard conditions.

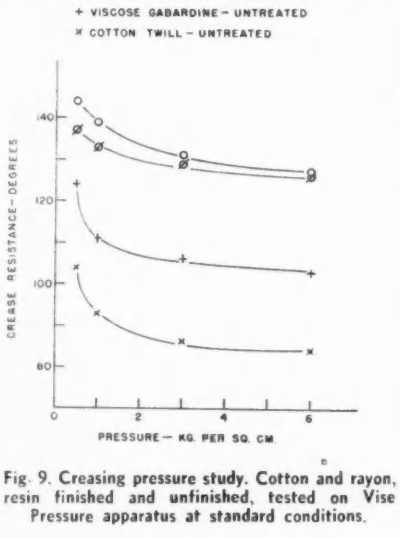

CONDITIONS – 70°F & 65% R.H.
○ COTTON TWILL – EXPERIMENTAL RESIN
⊠ VISCOSE GABARDINE – 10% AEROTEX RESIN M-3
+ VISCOSE GABARDINE – UNTREATED
× COTTON TWILL – UNTREATED
CREASE RESISTANCE – DEGREES
PRESSURE – KG. PER SQ. CM.

Fig. 9. Creasing pressure study. Cotton and rayon, resin finished and unfinished, tested on Vise Pressure apparatus at standard conditions.

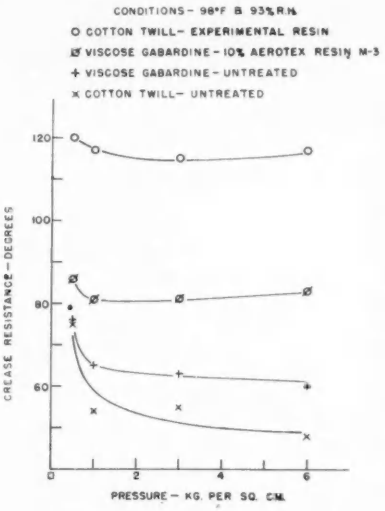

CONDITIONS – 98°F & 93% R.H.
○ COTTON TWILL – EXPERIMENTAL RESIN
⊠ VISCOSE GABARDINE – 10% AEROTEX RESIN M-3
+ VISCOSE GABARDINE – UNTREATED
× COTTON TWILL – UNTREATED
CREASE RESISTANCE – DEGREES
PRESSURE – KG. PER SQ. CM.

Fig. 10. Creasing pressure study. Cotton and rayon, resin finished and unfinished, tested on Vise Pressure apparatus at humid conditions.

in the two previous experiments. Five specimens were tested in the filling direction at each pressure. The period of creasing was fixed at 5 minutes and recovery time at 15 minutes.

Figures 9 and 10 show the outcome of these tests. Figure 10 demonstrates that pressures in excess of 1 kg. per sq. cm. produce little change in recovery. It may be that, when sufficient pressure has been applied to a sample to flatten the fold completely, additional pressure serves only to compress the double layer of cloth and has no further effect upon the final crease. Data obtained at standard conditions (Figure 9) are much the same, although in this case a greater pressure is necessary before the curves begin to approach the horizontal.

Although the creasing pressures encountered by most textiles in use may be lower by a factor of ten or more, it appears advisable to conduct comparative tests on fabrics of the weight and weave used in this work, at pressures indicated by the flatter portions of the curves. This conclusion was admittedly derived from only two fabrics, but appears valid on the basis of more recent experience.

PRESSURE DISTRIBUTION.—In the preceding three studies using the vise pressure instrument, effective creasing pressures, i.e., those existing *at the crease*, were assumed to be independent of the structure of the cloth. These pressures were calculated simply by considering the force and the total sample area exposed to the load. Although creasing pressures thus determined were relative, and hence sufficiently accurate for the foregoing experiments, they can be shown to be affected by the compressibility of the cloth.

Not only the force applied, but also the distribution of pressure on a piece of folded cloth pressed between two flat metal faces (T.B.L. and vise pressure methods), determines the pressure at the crease, the latter depending upon the compressibility. This arises mainly because the thickness is greater at the fold than elsewhere, resulting in "two-point loading". In slightly compressible cloths, the pressure distribution may be similar to that illustrated by curve H of Figure 11. Here the force (F) is supported by relatively small contact areas with consequent high pressures at these points. More compressible materials will tend to support the force over larger areas, resulting in a general levelling of pressure as indicated in curve S. Thus it is possible for textiles of differing texture to be subjected to different pressures at the fold even though they are loaded with identical external forces. Since the pressure *at the fold* is that effective in producing a crease, tests employing this method of creasing may be misleading.

If the force could be confined to the fold, more nearly constant pressures would be realized, independent of the mechanical character of the cloth. This could be partially achieved, as in the vise pressure apparatus, by reducing the area of the loading surfaces and applying the load directly onto the fold. However, sufficient reduction in area to assure sub-

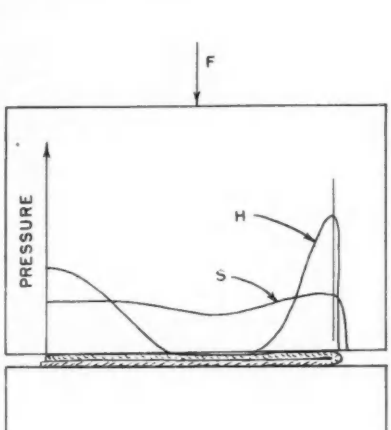


Fig. 11. Pressure distribution along folded cloth specimen between plane metal faces. H indicates distribution on hard cloth, S on soft. Note difference in pressure at the crease.

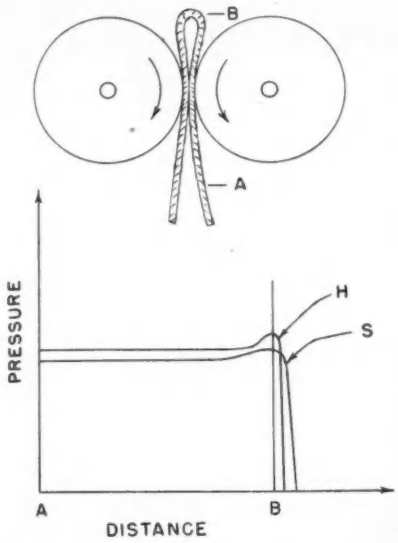


Fig. 12. Representation of pressure rise at the crease during creasing between metal rollers. H illustrates behavior of hard cloth, S soft. B. indicates the position at which the crease is directly under pressure.

stantially constant pressure makes simultaneous alignment of the pressure faces and the sample extremely difficult for the operator. An alternative method uses soft rubber surfaces instead of metal ones. This tends to equalize the load over the entire sample, because of the compressibility of the rubber, and results in a pressure distribution similar to that of curve S, Figure 11, for both hard and soft materials. An objection to this method was revealed by experiment however. For thin fabrics the soft loading surfaces must be identical in size and shape to the specimen and carefully aligned or indentation of the rubber by the specimen causes the load to be partly supported by the rubber area outside of the specimen.

PRESSURE APPLICATIONS BY ROLLERS.—A method was devised whereby the area of application of the creasing force is reduced to a minimum. It consists of passing a doubled specimen between rotating metal rollers of small diameter (0.5 inch), thereby confining the force to a small area and producing more nearly constant creasing pressures regardless of fabric structure. With this method the pressure on the cloth can be represented by the curves of Figure 12. As with plane-faced loading a hard cloth (curve H) will sustain greater pressures than a soft cloth (curve S); however, with the rollers, difference in pressure at the crease will be less than for flat loading because of the reduced area of contact. Compressibility of the cloth can also affect to some extent the duration of the creasing period when rollers are used. The material of curve H, Figure 12, for example will be creased for a shorter time than that of curve S. This is in a direction tending to compensate for the difference in pressure. That accuracy is not seriously impaired by slight variations in time and pressure among various cloths and treatments is shown by data presented after describing the apparatus employing the roller principle.

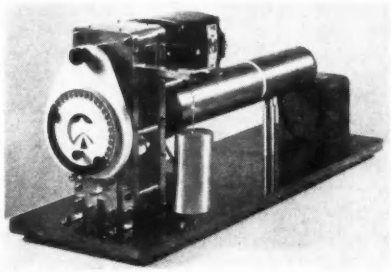


Fig. 13. Roller Pressure Crease Tester. Silhouette of rollers, cloth specimen and support have been inked on the screen for purposes of illustration in this photograph.

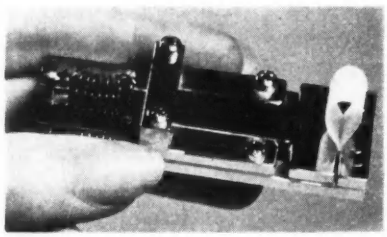


Fig. 14. Device for holding specimen in proper position for insertion betwen rollers.

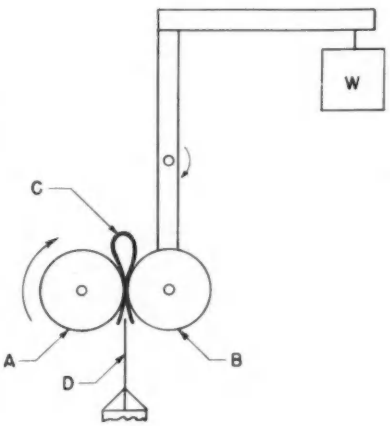


Fig. 15. Detail of mechanism for creasing test sample with Roller Pressure Instrument. A. Driven roller; B. Pressure roller; C. Cloth specimen; D. Support for creased specimen.

ROLLER PRESSURE APPARATUS.—On the basis of the foregoing investigations a second instrument has been devised for examining crease resisting finishes. Its use reduces the time to evaluate textiles in this respect, retaining a precision at least as good as that of the vise pressure and T.B.L. tests. It differs from the vise procedure only by creasing between rollers.

The instrument is shown in Figure 13. Specimens are cut from the fabric as rectangles 1 by 3 centimeters, and are looped double so that the tab ends can be gripped side-by-side in a smaller holder, Figure 14. By means of the holder a sample is inserted between the metal rollers, one of which can be retracted. A detail of the creasing mechanism is shown schematically in Figure 15. Roller "A" is driven at a slow rate, (one revolution per minute) carrying the sample downward. A crease is imparted to the sample "C" when its looped end passes between the line of contact of the rollers. Roller "B", in conjunction with the pivoted lever arm and the weight "W", produces a horizontal force of 2000 grams between the rollers. After the cloth has passed through the rollers it falls upon the knife-edged fence "D" where its crease angle can be measured.

The instrument is small, approximately 15 by 8 by 7 inches and hence convenient for use in confined spaces when tests at special conditions are desired. Once a sample has been introduced no further handling is required until it is removed. Simplicity of operation and accuracy of reproduction make the instrument useful for both laboratory development and production control testing.

COMPRESSIBILITY—TIME EFFECT IN ROLLER CREASING.—Before presenting the results of several crease studies performed with this instrument, variations in pressure and creasing time due to differing compressibility among cloths will be considered.

An experiment was designed using the roller instrument, in which the creasing period was held substantially constant despite variations in compressibility of the cloth. This was accomplished by replacing the metal rollers with rubber faced rollers of the same diameter but reduced in length to exactly that of the specimen width (1 centimeter) to prevent partial distribution of the load directly between the rollers when indented by the specimen. Variations in compressibility among cloths are thus incidental to the greater compressibility of the rubber, with consequent equalizing of pressure in all cases.

Eight textiles of widely differing weights

TABLE I

Comparison of Rubber-Faced and Metal Rollers

Material	Compressibility Mils	Rubber Rollers Crease Angle	σ *	Metal Rollers Crease Angle	σ *
Wool Flannel	19	146	1.2	141	4.6
Spun Viscose Gabardine	2.2	136	4.2	121	3.0
Acetate Rayon	2.9	125	4.6	107	8.4
Rayon Sheer	1.0	122	2.5	96	4.2
Rayon Suiting	2.0	112	2.7	89	2.3
Mercerized Cotton Twill	3.3	111	2.0	88	4.0
Cotton Percale	3.1	89	3.9	55	6.8
Cotton Voile	2.0	72	5.1	42	1.5

* Standard deviation of single test from the mean.

and compressibilities were tested with rubber-faced rollers and with metal rollers. Four kinds of rayon fabrics, three cotton materials, and one wool flannel, all without resin treatments, composed the test specimens. All tests were conducted at standard textile conditions, and at least five specimens determine each mean reported. The results are recorded in Table I. Included are figures designating the compressibility of the various cloths. These were determined with the Schiefer Compressometer (9) by recording thickness changes in thousandths of inches for a pressure change of 0.2 to 2.0 p.s.i. The materials are arranged reading from top to bottom in order of diminishing crease resistance as measured with the rubber rollers; correlation with the metal rollers is seen to be complete. These data have been plotted in Figure 16 to show that the two methods are linearly related.

Although rubber surfaced rollers theoretically improve uniformity of both time and pressure, their use presents the practical difficulty of specimen alignment, which arises because the roller length and specimen width must be identical. Metal rollers, by affording ease of specimen handling, are much more desirable from this standpoint. With experimental evidence to validate the choice, metal rollers have therefore been adopted.

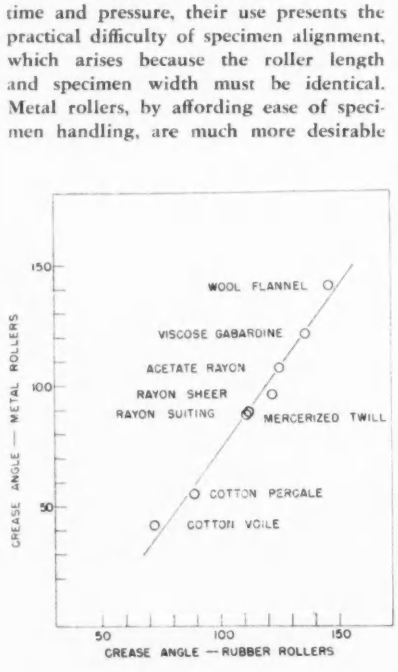


Fig. 16. Comparison of metal and rubber-faced rollers on eight untreated textiles.

LOW PRESSURE—LONG TIME VERSUS HIGH PRESSURE—SHORT TIME CREASING.—Estimates of crease resistance were compared as obtained by the short-time roller method and the more time-consuming vise procedure. The latter method simulates service conditions insofar as extended periods of creasing are likely to occur at comparatively low pressures. The roller test, by contrast, subjects specimens to greater pressures for a short period.

The same eight cloths used in the preceding study were tested at standard textile conditions. With the vise method a force of 500 grams was maintained between the pressure faces, a 30-minute creasing period was employed, and the samples were permitted 15 minutes to recover. In the roller test a force of 2000 grams between the rollers was used, and relaxation for ten minutes was found sufficient.

Table II shows the results by both methods. The roller pressure data have been copied from Table I. Qualitative ratings of the crease resisting properties of these textiles by both methods are given in the right-hand columns of the table. It is seen that the tests do not rate the materials in the same order, and that one single step and one double step interchange would be necessary to effect complete agreement. The single step discrepancy involving cotton percale and cotton voile is probably not significant on the basis of the indicated standard deviations. The double step interchange between rayon sheer and cotton twill cannot be attributed to experimental error, however. The vise pressure apparatus, although useful for tests of long duration, thus simulating conditions of use, is still subject to the defect of uncontrolled pressure at the crease, depending on the compressibility of the cloth. Since the eight cloths included in this study cover a wide range of physical characteristics (notably compressibility), effective creasing pressures with the vise test may vary widely and thus account for the double step inversion. The fact that the mercerized cotton twill sample has more than three times the compressibility of the rayon sheer specimen lends strength to this possibility.

COMPARISON OF ROLLER PRESSURE AND T.B.L. TESTS.—Illustrative data on cotton and rayon obtained by the roller pressure method are shown in Figures 17 and 18. Also included are data procured by the T.B.L. method. It can be seen that both tests evaluate the samples in the same relative order, however, the greater steepness of the lower curves reflects the greater sensitivity of the roller pressure test. This is illustrated by the choice of ordinates; the smallest readable scale division by either method corresponds to the same distance along the vertical axis on both the upper and lower curves. Although the data shown here rate the crease resistance of these materials relatively similar for each test, this need not always be the case. Difficulties in the T.B.L. test, cited previously, can give rise to distorted results.

(Continued on Page 536)

TABLE II

Comparison of Roller Pressure and Vise Pressure Results on Eight Fabrics

Material	Compressibility Mils	Roller Pressure Crease Angle	σ *	Vise Pressure Crease Angle	σ	Rating by Roller Pressure	Rating by Vise Pressure
Wool Flannel	19	141	4.6	145	3.8	1	1
Spun Viscose Gabardine	2.2	121	3.0	106	2.8	2	2
Acetate Rayon	2.9	107	8.4	99	4.1	3	3
Rayon Sheer	1.0	96	4.2	78	3.2	4	6
Rayon Suiting	2.0	89	2.3	82	3.0	5	5
Mercerized Cotton Twill	3.3	88	4.0	90	8.8	6	4
Cotton Percale	3.1	55	6.8	68	2.8	7	8
Cotton Voile	2.0	42	1.5	72	4.3	8	7

* Standard deviation of single test from the mean.

Proceedings of the

American Association of Textile Chemists and Colorists

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AUGUST 9, 1948

National Meeting and Convention Augusta, Georgia, Oct. 21-23

Headquarters: Sheraton Bon Air Hotel

Activities of Dining Committee for Augusta Convention

J. L. Wyman, chairman, and the members of his committee have met with those responsible for providing meals at the banquets and throughout the Convention. Arrangements have been completed by the Dining Committee to assure a delightful experience at every meal for the most fastidious epicure, including the true Southern style barbecue and fish fry on Friday afternoon of the Convention. You must be certain to attend this phase of the Convention to have a better understanding of that famous expression, "That's what I like about the South".

Other members of Mr. Wyman's committee are:

R. O. Simmons,
Pepperell Mfg. Co.,
Lindale, Georgia.

J. D. Mosheim
Crystal Springs Bleachery,
Chickamauga, Georgia.

J. C. King,
Fairforest Finishing Co.,
Spartanburg, South Carolina.

Luther J. McGinty,
Nyanza Color & Chemical Co.,
304 East Morehead Street,
Charlotte 3, North Carolina.

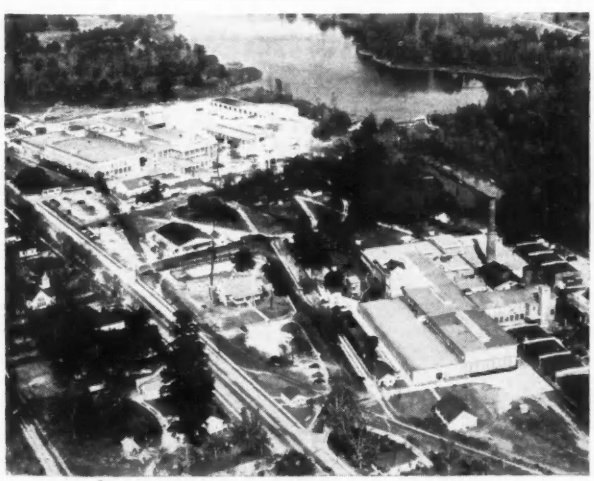
S. M. McKeown,
Graniteville Co., Sibley Div.,
Augusta, Georgia.

J. L. WYMAN
Chairman, Dining Committee

J. L. Wyman was connected with Sibley Manufacturing Co., Augusta, Georgia, as dyer from 1930 to 1932. He was foreman printer at Clearwater Finishing Company, Clearwater, South Carolina, for ten years and four months. He left this company to accept a position as salesman for Nova Chemical Corp. seven and a half years ago. He took three years leave of absence to serve in the Army as Captain in the Chemical Warfare Service.

Mr. Wyman is married and has a daughter. His hobby is golf.

Convention Theme: "Advancing Textiles through Research"



Photo, Courtesy, Augusta "Chronicle"

Clearwater and Seminole Plant

Saint Paul's Episcopal Church in Augusta was founded in 1750, but the present building, an exact replica of the original building, is the fourth to stand on the site. The first building was destroyed during the bombardments of the Fort in the Revolution and the second was removed early in the nineteenth century to make place for a new building. This edifice was burned in 1916, when the present building was built. During the Revolution the church was used by both the Americans and British as a hospital.

Photo, Courtesy, Augusta Chamber of Commerce

Rayon Dyeing and Finishing*

HARRY F. CREEGAN
*American Viscose Corporation***

Abstract

The paper discusses several phases of rayon dyeing and finishing including yarn and raw stock dyeing and tricot and woven goods dyeing nad finishing.

A suggestion is made for an improved type of raw stock dyeing machine, where the liquor would be forced through a narrow wall thickness of raw stock in a horizontal plane, rather than in the usual top to bottom flow.

A new skein dyeing technique for continuous filament yarn dyeing on the cascade type machine is discussed and explained. This technique was developed at the Textile Research Department of American Viscose Corporation.

Package dyeing of spun rayon yarns is discussed, with suggestions for work which should be done to improve present techniques.

A new machine for presetting acetate tricot fabrics, also developed at Textile Research Department, is explained and discussed. Although development work is not yet complete, the machine will preset these fabrics against crow's feet and crack marks, and also allows open width presetting, to eliminate edge curling and the need for tacking and sewing.

Several new machinery developments for piece goods are mentioned and the use of pad-beck techniques for direct color application is discussed.

WE shall discuss tonight an extremely broad subject. Rayon dyeing and finishing as a title really covers the entire field. Our reason for selecting this title was that we wished to discuss several phases of rayon dyeing and finishing It will not be all inclusive in nature, but rather will attempt to report on the status of several development programs in which we are engaging at Marcus Hook, and to bring to the attention of this group some of the interesting developments which are occurring in the trade. Neither will this discussion be a highly technical one, but will attempt to discuss practical application methods in the dyeing and finishing of rayon. We shall also attempt to point out avenues along which development work is still needed, and hope that at least a few of those present will go home with a new idea to try out in his own establishment.

Raw Stock Dyeing

The first phase to come under discussion will be the dyeing of rayon in loose, or raw stock form. Rayon raw stock is usually dyed today in machinery already in existence for dyeing wool or cotton raw stock. Most of the equipment for this purpose is of the circulating type. With direction of flow in many cases from top to bottom, it is difficult to get level results on rayon, in fact it is well nigh impossible with vat colors. Rayon will pack much closer when wet than either cotton or wool and, therefore, presents a more impenetrable mass to the flow of dye liquor. One machinery manufacturer has relieved this condition somewhat by adding a series of perforated trays to the pressure chamber so that the rayon raw stock is separated into three or four layers. By this expedient the raw stock is broken up into several layers, each of which presents a relatively small wall thickness to the flow of liquor. This is certainly a step in the right direction but still does not allow perfect results with vat colors. Of course, with the blending that usually occurs with dyed raw stock, perfect levelness is not absolutely necessary. Why then concern ourselves at all with attempting to improve raw stock dyeing conditions? To this speaker it would seem a definite advantage if each lot of rayon raw stock could be dyed perfectly level. All doubt in shade matching would be eliminated. Precise formulas and procedures could be set up for any given shade, which would allow extremely close matching on successive dye lots.

In what direction should the machinery manufacturer go in seeking to build an improved raw stock dyeing machine? A brief review of the various problems to be overcome should serve to stress the characteristics needed in such a machine.

The basic problem is to bring an aqueous dye liquor into contact with a mass of loose fibers. We know that these fibers, vigorously agitated, will mat and be difficult to process. Experience has shown that for best results the dyeing liquor must be forced through a mass of fibers rather than the fibers being agitated in the dye liquor. The fact immediately suggests a circulating type machine.

This same mass of fibers will pack very closely when wet, offering considerable resistance to the flow of liquor through the mass. To accentuate this problem, when vat colors are used, their extremely high affinity for the fibers leads to difficulties that can only be overcome by a high rate of flow. Any circulating machine should therefore move the dye liquor through this closely packed mass of fibers at a rate of flow greater than the exhaustion speed of the vat dyestuff.

An ideal machine, therefore, for dyeing rayon raw stock would be of the circulating type with sufficient pump power to produce a high rate of flow. The dyeing chamber of this machine should be so designed that the liquor is being pumped through as narrow a thickness of raw stock as possible. Such a machine has been built for lots of 50 to 100 lbs. of stock. In these machines the stock is packed into a perforated basket containing a perforated center column. The dye liquor is then pumped horizontally through the stock. The advantage of this machine is that there is a small wall of stock to pump through (in the neighborhood of 12"), and that the horizontal flow of liquor does not tend to pack the stock as does the usual top to bottom flow. Also direction of flow is periodically changed in this machine increasing the chances of level dyeing. We have a machine of this type at the Textile Research Department and are able to get beautiful results with vats on rayon raw stock. If such a machine could be built to handle 500 to 1000 lbs. lots it should solve a lot of the problems that exist in rayon raw stock dyeing.

* Presented at meeting, Philadelphia Section, May 14, 1948.
** Now with Rodney Hunt Machine Company.

Yarn Dyeing

The next logical phase of rayon dyeing worthy of discussion is yarn dyeing. Here both filament and spun yarns are of interest. The opportunity for machinery development does not seem as great in this field as in raw stock dyeing but there is still room for improvement of present techniques on existing machines.

Discussion of the dyeing of continuous filament yarns can well begin by saying that the cascade type of yarn dyeing machine does an excellent job on this type of yarn from all angles, including level dyeing, ease of winding, and duration of dyeing cycle. Recent work that we have been doing at the Textile Research Department in Marcus Hook has shown that direct colors may be applied to 8 ounce skeins of 75 and 150 denier yarn in as little as 5 minutes for pastel shades, and 10 minutes for medium and heavy shades. With such a short dyeing time the yarn is in excellent condition for winding.

But the most interesting work we have done has been on the dyeing of 8 ounce 75 denier skeins, on the cascade machine, with vat colors. Although our program is still far from completed on this project, we have been able to produce vat shades, levelly dyed, that will wind off almost as easily as greige skeins. There has been nothing really unusual about the procedures. We have simply followed a few sensible rules which any skein dyer can easily observe, making his work easier by adhering to these rules.

At the risk of having to retract some of these rules when more work is done, we should like to enumerate them now.

1. Never allow the rotating arm to make more than one revolution at a time even when wetting out the yarn. Start off with the rotation lever set on automatic and keep it there throughout the dyeing. It is obvious that excessive turning of the arm only serves to disturb and open up the individual filaments in the yarn, and serves no useful purpose as far as dye levelness is concerned. We have found that a 30 second rotation cycle gives satisfactory levelness with a minimum of damage to the yarn.

2. Whenever possible, keep the steam shut off while circulating liquor through the yarn. With open steam being forced into the dye liquor, the disturbance created seems to carry air up through the yarn, increasing the chance of distortion of filaments and subsequent poor winding.

3. This rule is an exceptional one and, we believe, contrary to trade practice. Make all dyestuff or salt additions with the dye liquor being circulated through the yarn. If the yarn is raised on the rotation arm with the circulation cut off, as is common practice when adding dyestuff or salt, the yarn becomes so packed that it is difficult for the liquor to penetrate to all parts of the skein immediately. When the yarn is left on the perforated arm, however, with the liquor still circulating through it, penetration of the dyestuff through the skein is almost immediate. When using this method one should always make additions at the end of the machine farthest from the drain opening.

4. Do not overload the arm of the machine. Use 10 lbs. of yarn for vat colors and 12 lbs. for direct colors.

By following these rules we have had considerable success in skein dyeing of filament yarns. In the application of vat colors, we have improved dyeing levelness by adopting a cold dyeing procedure. Here is a typical formula for a Royal Blue BCS type, which we all know to be a bad actor. This formula is for a 3 arm machine, using 45 gallons of water. The yarn is loaded on the machine, 10 lbs. to the arm.

Scour

Synthetic Detergent	.3 lbs.
T.S.P.P.	.3 lbs.

Bring to 140° F. and circulate 2 minutes with steam off. Drop.

Weigh out

Hydro	4 lbs.
Caustic Soda 40%.....	4 qts.
Vat Blue BSC Dbl. Paste....	3 lbs.

Add 2/3 of the caustic and hydro to the machine. Add the balance to the dyestuff in 6 gallons of water at 140° F. The hydro and caustic should be added to the dyestuff just before using in the case of Blue BCS. We have found that if allowed to stand too long, the blue will over-reduce and produce a very greenish shade.

Circulate the caustic and hydro through the yarn for one minute at tap water temperature. Add the dyestuff solution in 3 equal parts at 1 minute intervals. Circulate for 3 minutes after last addition while bath is still cold. Raise temperature to 130° F. over a five minute period. Run an additional 5 minute period with the steam off. Drop and rinse 2 minutes with cold water. Drop. Oxidize in 0.5 lbs. perborate of soda for 5 minutes at 140° F. Raise to 200° F., add 0.5 lbs. of synthetic detergent and run 2 minutes. Drop and finish off with 0.6 lbs. of Avcolube #100 for 2 minutes at 100° F. The total time on the arm should be about 35 minutes. We have found that 8 ounce 75 denier skeins, so dyed, will wind off with practically no breaks.

You will note that in this procedure we have broken our own rule about keeping the steam turned off during the dyeing cycle. Since the steam valve is just cracked to bring the temperature from about 55° F. to 130° F. in 5 minutes, there is little chance for distortion of the yarn.

Note also that no additions of hydro have been made as are necessary when dyeing at higher temperatures. By dissolving the hydro cold and slowly raising the temperature, the hydro breaks up much more slowly and is more effective in the bath.

The technique which we use for dyeing direct colors is as follows: With 12 lbs. of yarn on the arm the bath is made up with 1% synthetic detergent and 1% T.S.P.P. The temperature is raised to 210° F. and the steam shut off. Circulation is begun, and after one minute the dyestuff solution is added and circulated for two minutes. 5% to 15% of salt is then added in four parts starting with 1/15 the total amount and doubling the amount for each addition. These salt additions are made at 1 minute intervals, and dyeing is continued for 4 minutes after the last addition of salt. The bath is dropped and the yarn finished off with 2% of Avcolube #100. Dyeings are level and the yarn is in excellent condition.

This work has been most interesting to us. We have yet to run through many of the commonly used dyestuffs before we can call the project completed, but results to date have been most gratifying. We have also had a few opportunities to try these procedures on commercial size dye lots, and have so far met with success.

We should at this time mention cake dyeing. It is our belief that this method of dyeing continuous filament yarn will eventually take the place of skein dyeing. As you know the British have carried this form of dyeing to commercial practice and have been quite successful. Spurred by the success of the British, a great deal of work is being done in this country to adapt cake dyeing techniques to American procedures. Since Mr. Woodruff, head of our Textile Development Laboratories, has recently delivered a paper* on this subject before the New York Section of this Association, we do not propose to go into detail on cake dyeing at this time. However, all yarn dyers should keep themselves posted on the most recent advances in this phase of rayon dyeing. For this purpose Mr. Welch, who has done much of this work at Marcus Hook, is here tonight and will be happy to answer any questions which you may have later.

Let us now consider the dyeing of spun rayon yarns. As far as our own work is concerned the same techniques we have developed for skein dyeing of continuous filament yarn apply to spun yarns, with the exception that about ½ the normal load of yarn is used on the arm of

* See American Dyestuff Reporter, June 28, 1948.

the machine. Package dyeing of 100% spun rayon yarns presents many problems. Although direct colors can be easily applied, the application of vat colors offers a great deal of opportunity for development work. Although vats are being applied commercially today, only the lower counts are being dyed. To our knowledge nothing finer than a 20's cotton count is being done. Even these counts are only used in patterns where perfect levelness is not necessary.

Our work at the Textile Research Department has only scratched the surface of the possible avenues of investigation in this field. We have been able to get fairly level results on a 30/1 spun rayon yarn using a 12 ounce package wound on a 5/8" perforated tube. Our work has been confined to one shade, a vat tan, using a mixture of Brown BR, Flaming Orange 3RD, and Grey 2G, but we have not done enough work to make any claims for success. Although we hope to start a fairly intensive program soon, when we will get somewhere is anybody's guess.

Suggested avenues for research for those who are interested might be conducted along the following lines. John Boulton, of Courtaulds, England, at a recent meeting of the New York Section of the AATCC mentioned several methods which have been tried in England.* He highly recommended the use of sulfite waste liquors as a retarding agent for vat colors, providing magnetism salts are present. In fact, Mr. Boulton stated that they make sure that magnesium salts are present by adding 2% of Epsom Salts to the dyebath when using this type of retarding agent, which is used at 3%. Mr. Boulton points out that the vat leuco, the lignin sulfonate, and the magnesium, form a metallic complex which slowly releases the leuco compound and allows dyeing to proceed at a slower rate than is normal for the particular dyestuff involved.

Another successful experiment which has been tried in England is the use of solvents to improve the solubility of the leuco compound and thereby slow down the rate of dyeing. Excellent results have been obtained by dyeing in a 5% solution of butyl carbitol. This procedure is admittedly expensive but is worth remembering when and if the cost of such solvents might be reduced. Our own work has shown that even small amounts of ethyl alcohol in the bath improve levelness.

Some comprehensive work could be done comparing the relative merits of various dispersing and retarding agents. The relative merits of cold dyeing versus hot dyeing procedures should be investigated.

It would be well to examine the problems involved in package dyeing spun rayon yarns. The ability of rayon to absorb moisture, and the swelling which occurs, presents a problem of circulation through the package. This is the greatest problem to be overcome. It is possible that new pump designs may have to be evolved, developing greater flow rates than are obtainable today, to force the dye liquor through the package at a great enough rate. Formation of package should be studied, not only density and wind, but also package shape and formation. This has been done in England, where spun yarns have been wound into a 3 lb. mock cake and dyed very nicely in cake dyeing machines. All in all, this field is wide open for research from all angles.

* See American Dyestuff Reporter, June 28, 1948.

Tricot Finishing

The field of acetate tricot finishing is one which will bear considerable investigating. The normal procedure for these fabrics is to first tack or sew the edges of the fabric. This is usually necessary to prevent curling at the edges, which will occur unless the fabric is of a stable stitch construction. The pieces are usually handled in bundles when being transported in the greige. At this point some mills subject the fabric to a presetting operation, while others take the goods to the dyebeck immediately and begin the scouring operation. The question of presetting has been the subject of much discussion, but most finishers seem to be agreed that it is desirable if crow's feet and crack marks are to be eliminated. This presetting operation consists of treating the fabric in a flat condition, usually after tacking, by passage through water as near the boil as possible, followed by a cool water treatment. This operation should be done as slack as possible. Since cellulose acetate is a thermoplastic yarn, the boiling water softens the fibers, and the cool treatment following allows the yarn to cool below this softening point and become set, so only by approaching the temperature of the presetting bath will the yarn lose the shape it has assumed. This process, of course, is similar to the preboarding process used on nylon hosiery.

Following presetting, the fabrics are scoured and dyed in the dyebeck with care to keep temperatures below that of the presetting operation. The goods are then centrifuged and dried on the pin tenter. Usually no other finishing is necessary. The fabrics are slit to the desired width for the cutting table as they are taken off the pin tenter.

Fabrics so handled have a very desirable hand, but there has been some sales resistance to acetate tricot dress fabrics. We hear constant complaints from the consumer that this fabric either shrinks too much or sags too much. In beginning the study of these undesirable features, we were struck by the fact that cellulose acetate is a relatively stable yarn in itself and one which should not lend itself to dimensional change under normal conditions. We, therefore, felt that if any improvement were to be effected in these qualities, the best chance of achieving improved stability would be in the presetting operation. Those of you who are not familiar with knitted fabrics cannot begin to imagine the stability problems which exist. With a woven fabric, the yarns are in a straight, perpendicular pattern crossing over and under one another. If strain is exerted lengthwise on the fabric, there is a lengthening in that direction and a shortening of the width. This change, however, is one which is rather easily controlled except in the lightest weight fabric. In knit goods, however, the yarns are looped around one another so that a strain in any direction tends to straighten out these loops, and the dimensional change in the perpendicular direction is terrific. It seemed, therefore, that if the acetate tricot fabric could be preset in a fully relaxed condition, the loops should assume their most natural and most comfortable conformation and be set in that shape. Then, if subsequent processing tensions were kept at an absolute minimum, a relatively stable fabric should result. This line of thinking immediately brought out another possibility. If presetting could be done so that the fabric were free of strain, would it also eliminate the tendency of the fabric to curl?

We, therefore, set about the designing of a machine which would handle the fabric open width instead of tacked, allow complete relaxation, and afford presetting action against crow's feet and crack marks. We believe we have accomplished our purpose. Although the machine which we have built is even now undergoing mechanical changes to effect simplification and eliminate some mechanical bugs, we have been able to produce fabrics which will dye open width without curling, free of crack marks and crow's feet, shrinkage within 5%, and showing practically no sagging.

We believe, however, that to be fully effective this presetting machine should be supplemented by a pin tenter equipped with an overfeed. With such a device the finisher has control over the dimensions of the fabric both coursewise and walewise.

The machine itself in its original form consists of a wooden tank containing two driven endless blankets which carried the fabric through the boiling water bath

between them. These blankets were separated just enough to allow the fabric to be free to shrink and change dimensions in any way it wished. The cool water treatment was supplied by a spray at the exit end of the machine. Our trials with this machine have indicated that even simpler mechanical means may be used to effect the same result. It is to check these ideas that we are now making the mechanical changes discussed before.

Work with this machine has taught us several things. We have found that with the complete relaxation obtained during presetting, the fabric must be free of wrinkles before the treatment. This means that the goods must be delivered to the dyer on rolls, instead of in bundles as is now the practice. Our Knitting Division advises us that this should not represent any great hardship for the knitter, who should be able to use removable take-up rollers on the knitting machine, the fabric being transported to the dyer on the same roller onto which it has been knit.

We have also found that only a very short time is necessary in the hot water to effect elimination of the edge curling characteristic, and to obtain setting against crow's feet and crack marks.

The work we have done on this presetting problem has made us more aware of the many problems which exist in finishing this type of fabric. The fact that it eliminates the curling of acetate tricot leads to excellent possibilities for semi-continuous methods of dyeing and finishing. We visualize the fabric being processed in beck load lots of 10 to 20 pieces sewn continuously. The fabric could be preset in one run and loaded into the beck in one continuous strand as is common in the dyeing of woven rayon fabrics. Following dyeing, the fabric would be opened and extracted on a tensionless suction slot which will be discussed later, and proceed continuously into an overfeed pin tenter without having to break seams.

We hope this angle on tricot finishing will be interesting to the trade and point a way to improve present methods. Our Dyeing and Finishing Division would be happy to cooperate with anyone desiring to investigate such procedures.

Woven Goods

In discussing the dyeing and finishing of rayon woven goods, we can add very little to what has already been said and done. Our set-up in Marcus Hook does not fit in with the new continuous methods of vat dyeing such as the pad-steam range and the Williams unit. We are, therefore, not qualified to speak in detail on these machines. We have, however, done some interesting work on the application of direct colors.

We have established, to our satisfaction, the advantage of applying direct colors on the padder. On spun rayon fabrics it is often difficult to get level results, due either to yarn unevenness or to a tightly packed construction which makes penetration difficult. Obviously, padding on of the dyestuff will overcome the penetration problem. It is the theory that when fabrics are dyed by padding on the dyestuff followed by a salt boil in the beck, dyeing proceeds from the inside of the fiber to the outside, rather than from the outside in as is naturally the case with normal beck dyeing. This procedure of padding followed by beck treatment also fits into semi-continuous operation when the beck is laced continuously, and reduces the time in the beck, since 20 minutes is usually sufficient to complete the dyeing.

We are well aware, of course, of the problems involved in matching shades by this procedure, but it is amazing what can be done with a little attention to detail. The dyer should keep in mind that a formula for any given shade includes not only the proportions of dyestuff, but the temperature of the solution, the degree of pressure on the pad rolls, and the conditions in the beck, such as liquor ratio, temperature, salt, etc.

We have found this pad-beck procedure to be helpful with some of the new yarns that are beginning to appear, such as linen spun rayons and stretch spun yarns. In the one case yarn unevenness is prevalent and in the other the intense strain used in breaking the fibers often results in streaky dyeing. The pad method aids considerably in overcoming these conditions.

These padding techniques are not brand new ones, having been used for some time by many dyers for the application of direct colors to difficult rayon fabrics. We feel, however, that they have been overlooked by many dyers who have been frightened by shade matching difficulties. The possibilities for continuous processing should be considered by every dyer, since the increased production that is possible offers plenty of compensation for the additional trouble in matching shades. The padding techniques also offer possibilities for the application of direct colors to filament warp fabrics (such as fugis and french crepes), in the greige when gelatine type sizes are used. Scouring and dyeing is then accomplished in one operation.

Tensitrol Principle

The newest and most interesting machinery development for rayon piece goods is the "Tensitrol" principle developed by Rodney Hunt. This principle may be applied to either rope or open width handling and allows practically tensionless, continuous processing. This is accomplished by the simple expedient of over-driving the bottom rollers of either an open width or rope range, so that the surface speed of these overdriven rollers will be in the neighborhood of 30% greater than the surface speed of the take-out rollers of the range. Briefly, if the fabric wants to shrink it comes in closer contact with the overdriven bottom rollers and is advanced at a greater rate of speed. If the fabric stretches, it falls away from the bottom rollers and advances more slowly. In this way, tensionless processing is assured regardless of the shrinkage which might take place. This device should find immediate use in the processing of rayon fabrics, since it allows continuous scouring and dyeing procedures which should deliver fabrics closely approximating those handled in the beck for appearance and hand.

In addition to use on woven fabrics, this new principle of continuous processing may well be applicable to knit goods and many other forms of processing. The trade is being offered at present an open width machine and a tight rope washer. Others will be offered as various possibilities are developed and proved.

Tensionless Extractor

Another interesting machinery development, which is not yet common knowledge, is a tensionless suction slot extractor. This machine was developed by a well-known finishing plant, and has now been placed in the hands of the Morrison Machine Company for distribution to the trade. Instead of the usual slotted pipe, a perforated, hollow roller is fitted around the slotted pipe and so sealed that the vacuum is not broken and is always across the top of the roller. This perforated roller is driven, so that suction extraction can be accomplished without the usual tension necessary to draw the fabric across the suction slots.

Each of these developments opens the way for continuous processing on certain fabrics previously handled in batch form because of the need of relaxation. There can be no question that continuous processing will become as much the order of the day with rayon fabrics as with cottons.

Finishing Treatments

We have not even touched on the pos-

sibilities in finishing treatments. Much has been written on the application of resins to rayon fabrics and the resin manufacturers are conducting constant research on this subject. One interesting point which we have recently uncovered at the Textile Research Department concerns the effect of Ceglin on rayons. We have found that when originally applied there is very little improvement in the tensile strength of the fabric. However, after 20 successive launderings we find that the warp strength of the Ceglin treated fabric is 30% greater than that of the untreated fabric. This fact is often overlooked as a property of the alkali soluble celluloses, but can be of importance for some fabrics.

More research is still needed on shrinkage control of rayon fabrics. There are a number of excellent processes available to the finisher today, but each one has its bad features. We at American Viscose Corporation are still pursuing this problem with considerable interest.

Conclusion

In conclusion let us sum up the problems mentioned here which deserve attention.

In raw stock dyeing there is room for improvement in available machinery.

In yarn dyeing both cake and package dyeing require plenty of development work.

The whole problem of tricot finishing calls for active development work.

In woven goods dyeing and finishing, we seem to be in the position of learning to use both the machinery and techniques which are available today. There is still, however, room for new developments.

We venture to suggest that when the going really gets tough again, it will be the dyer and finisher who has kept abreast of all the new developments, and has contributed some of his own initiative to these developments, who will be best able to enter a competitive market with promise of success.

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Intersectional Contest Committee, South Central Section

THE chairman of the Intersectional Contest Committee for the South Central Section is Joseph H. O'Neill who has been Chief Chemist of the Trion Division of Riegel Textile Corporation since 1943. He was formerly connected with the Eagle & Phenix Mills of Columbus, Georgia for 13 years, serving variously as Overseer of Raw Stock Dyeing, Overseer

JOSEPH H. O'NEIL

Chairman, Intersectional Contest Committee, South Central Section

of Piece Dyeing, and Laboratory Director. Mr. O'Neill will present the paper in the Contest which will be held in conjunction with the National Meeting in Augusta, Georgia October 21-23. Other members of the South Central Contest Committee are:

Harold C. Asbury,
E. I. duPont de Nemours & Co., Inc.
Glenn Bellamy,
Ciba Company, Inc.
J. A. Crumley,
Bryan Full Fashioned Mills
Charles Gordon
Trion Division, Riegel Textile Corp.
E. V. Helms,
Geigy Company, Inc.
A. J. Kelly,
Burkart-Schier Chemical Co.
W. K. Newman,
Peerless Woolen Mills
Stanley Shultz,
American Dyewood Company
H. A. Webb,
General Dyestuff Corp.

The judge will be W. S. McNab, Quaker City Chemical Division, O. F. Zurn & Co.

The title of the paper is "Vocational Texts in Practical Wet Processing."

CALENDAR

PHILADELPHIA SECTION
Meetings: September 24, November 12, January 28, 1949 (Kugler's, Philadelphia).

NORTHERN NEW ENGLAND SECTION
Meetings: September 24 (Andover Country Club); November 19.

SOUTHEASTERN SECTION
Meetings: September 25 (Columbus, Ga.); December 4 (Atlanta, Ga.).

WESTERN NEW ENGLAND SECTION
Meetings: September 10, October 29, December 4, January 15, 1949, February 26, April 8, May 20.

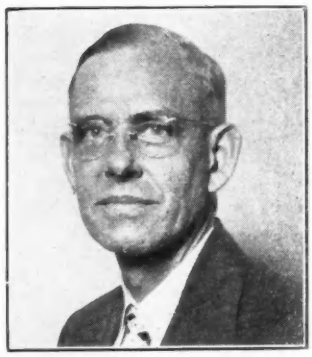
SUB-COMMITTEES
Meetings: September 23 (Hotel New Yorker, New York).

COUNCIL
Meeting: September 24 (Hotel New Yorker, New York).

RESEARCH COMMITTEE
Meeting: September 24 (Hotel New Yorker, New York).

NATIONAL CONVENTION
October 21-23 (Sheraton Bon Air Hotel, Augusta, Ga.).

Secretary, Intersectional Contest, National Committee



L. W. CRAFT

Secretary, National Intersectional Contest Committee

SERVING as Secretary for the National Intersectional Contest Committee is L. W. Craft of E. I. du Pont de Nemours & Co., Inc.

Mr. Craft attended the University of Pennsylvania and started with the Du Pont Company at the Jackson Laboratory, Analytical Division. He later was employed at the Technical Laboratory, the Rubber Laboratory and the Boston Office of Dyestuffs Division. At present he is in the Organic Chemicals Department in the New York Office.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

48-9

Education: B.S., Bates.

Experience: Woolen mill chemist; miscellaneous testing, demonstration and development work on all fabrics for supply houses, as head chemist.

Age 41; married; references.

Scientific Study of Rayon Dyeing*

G. L. ROYER

Research Department, Calco Chemical Division, American Cyanamid Company, Bound Brook, N. J.

DYEING has been an art which the dyer learned from the experience of those who practiced before him and by continued practice himself. This status of dyeing is slowly changing due to the various scientific investigations that have been carried out or are in progress. Thus, the scientific approach to rayon dyeing has resulted in such work as that of Whittaker, Wilcock, Boulton, Morton, Dolph, Fothergill, Wardle and Reading of Courtaulds; those of Vickerstaff, Lemin and Vickers of I.C.I.; those of Preston and Neale of Manchester Technical College; and those of Standing, Warwicker, Willis and Urquhart of Shirley Institute. Some of these investigations have been theoretical in their approach while others have been more technological. C. E. Sparks *(1)* has recently emphasized the need for fundamental data in the field of dyeing, while an editorial in *The Dyer* of October 10, 1947, discussing the Society of Dyers and Colourists "Symposium on Recent Advances in the Theory and Practice of Dyeing" held in September at Blackpool, makes the following statement: "If there was a blemish on this admirable event, it was that the ratio of academic papers to practical ones was rather high, and that in the discussions the voice of the theorist was heard much more frequently than that of the practical man. . . There are still many gaps between theory and practice and one looks forward to further meetings at which the practical man and the scientist will be drawn closer together, the one learning how the results of research might be applied in his works and the other receiving knowledge and ideas which might point the way to new lines of research." Whether a study of rayon dyeing is fundamental, theoretictal, technical, or practical, its purpose should be to obtain information about the process so that dyeing can be carried out more rapidly and more economically with a better understanding to give the same or better results.

* Presented at meeting, Rhode Island Section, April 23, 1948.

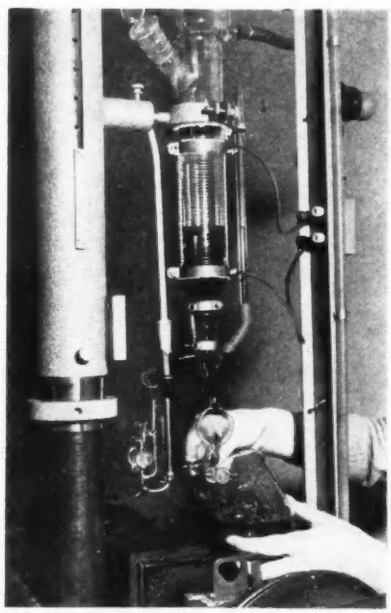


Figure 1. Close-up view showing the Operator Draining the Dyeometer Unit.

The purpose of this paper is to review some of the work done in our laboratories in the study of rayon dyeing. The lecture presentation of this paper was supplemented by a large number of Kodachrome color slides which were shown to illustrate the various factors which affect the dyeing of rayon. It is not possible to reproduce these and a word picture of the work will therefore be given.

Dyeometer Studies

A recent paper on studies of rayon dyeing by Royer, McCleary and deBruyne *(2)* covers the results of measurements made with the Dyeometer *(3)*. This instrument was developed in the Calco Research Laboratories some years ago to permit continuous photometric measurements of the strength of the dye bath during the course of the dyeing. (See Figures 1 and 2.) It permits rigid control of every factor believed to influence the progress of dyeing; some of these factors are variations of temperature, volume of the dye bath, circulation of the dye bath, motion of the material being dyed, and control of surrounding atmosphere. The measurements obtained make possible the plotting of dyeing curves in which the per cent dye bath strength is plotted against time of dyeing. (See Figure 3.). Up to the present time, it has not been possible to analyze these dyeing curves and express them by simple numerical constants. However, certain important characteristic values can be taken from these data and used for the numerical expression of the results. (See Table I.). One such characteristic is "the initial dyeing rate" which is expressed in the per cent dye bath exhaustion per minute and is numerically equal to the initial slope of the dyeing curve. It is the measure of the rate at which dyeing proceeds immediately after the instantaneous surface sorption of the dye. Another characteristic value which can be determined in the equilibrium exhaustion value. A third characteristic is the time necessary to reach 90% of the equilibrium exhaust value, and this was chosen because it is near the end of the dyeing process and yet is on a part of the curve which has enough slope to permit accurate reading of the time value. While these three values do not describe the complete dyeing operation as well as the dyeing curve, they are quite useful in presenting the most essential data so that the comparison of the dyeings can be made from them alone.

The study of rayon dyeing was approached from two different points of view: first, that the dyeing behavior was affected by manufacturing variations in the rayon itself, and, second, from the point of view of the dyeing behavior as affected by the dyeing conditions. In the entire study, Calcomine Sky Blue FF Ex-

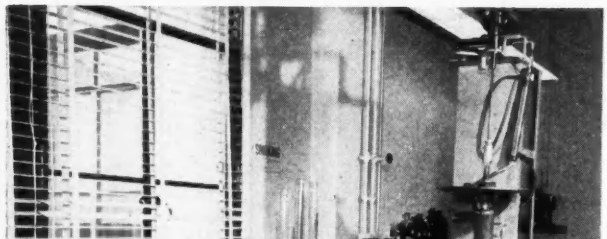


Figure 2. View Showing the Dyeometer Unit in Position in a Recording Spectrophotometer.

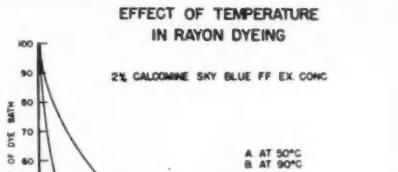


Figure 3. Dyeing Curves for 10 Grams of 1.02 Denier Viscose Rayon Dyed at Two Temperatures, in a 400-ml. Bath with 10% Sodium Chloride.

TABLE I

Effect of Filament Denier on Dyeing Behavior of Rayon

Filament denier	1.02	1.27	1.68	2.98	3.72	4.90	6.45	11.85
Initial dyeing rate at 50° C.	11	7½	7½	7	8	5½	5½	3½
Initial dyeing rate at 90° C.	29	32	29	20	23	23	17	17
t(90%) at 50° C., min.	40	47	47	..	..	..	..	..
t(90%) at 90° C., min.	7	8	8	12	10	15	21	19
% Equilibrium exhaustion at 50° C.	96	98	96	..	..	..	..	..
% Equilibrium exhaustion at 90 C.	83	83	83	83	83	82	84	84

tra Conc. (C. I. 518) was used because it is a dye which accentuates differences in the dyeing properties of viscose rayon and also is quite sensitive to variations in the dyeing conditions. The factors entering into the manufacure of rayon which were studied for their effect upon dyeing are filament denier, delusterant, skin structure, age of viscose, degree of polymerization of the finished yarn, and stress applied during spinning. For a study of the dyeing conditions, the variables were changes in salt concentration, type of salt, yarn weight, temperature and dye concentration. A brief discussion of the effect of these factors on dyeing will be given.

EFFECT OF FILAMENT DENIER.—Bright rayons of deniers from 1 to 12 were studied. The initial dyeing rate was greatest for the smaller deniers while the time necessary to reach 90% exhaustion increased with the increase of denier size. As would be expected, there was very little difference in the per cent exhaustion at equilibrium. However, even though all the rayons of the different deniers had the same amount of dye per gram of rayon at equilibrium, there was a considerable difference in the visual appearance of the actual skeins. This is due to the tremendous difference in surface area of the fine deniers in comparison with the coarse deniers.

Increased surface area of the fine fibers reflects a great deal more light from the surface before it has a chance to enter into the body of the fiber where the color is. Thus, as it is well known, it is necessary to increase the dye concentration in the finer deniers if one wishes to obtain the same color value as in the coarser deniers.

EFFECT OF SPINNING STRETCH.—Dyeings were made on rayon samples prepared with 0 to 50% stretch between the godets. An increase in stretch applied during spinning results in a decrease in initial dyeing rate and an increase in the time necessary to reach equilibrium but it did not affect the equilibrium exhaustion.

EFFECT OF VISCOSE AGE.—Viscose ageing times of 62 to 140 hours were studied in regard to the effect of this factor on the dyeing behavior of the final viscose yarn. The initial dyeing rate decreased slightly and the time necessary to reach 90% of equilibrium exhaustion value tended to increase with an increase in the ageing time of the viscose.

EFFECT OF SKIN.—Dyeing tests were made on two bright viscose rayon yarns, one having no skin and the other a thick skin. The thick skin yarn dyed somewhat slower but attained the same equilibrium value as the no-skin yarn. Examination of the microscopical cross sections of these two yarns showed that the dye had penetrated through the thick skin yarn and had concentrated in the center portion, whereas on the no-skin yarn the fiber was uniformly dyed throughout.

EFFECT OF DEGREE OF POLYMERIZATION.—Three rayon yarns were prepared from viscose dope having different degrees of polymerization. As the degree of polymerization value increased, the initial rate of dyeing decreased and the equilibrium exhaustion increased. These differences in the exhaustion curves, although small, appeared to be real and to be associated with the degree of polymerization of the cellulose.

EFFECT OF DELUSTERANTS.—Dyeing rate tests were made on three rayons of similar fiber diameter: (1) unpigmented, (2) pigmented with titanium dioxide, and (3) delustered with oil. The presence of the delusterant had only a slight effect on the comparative dyeing behavior of the three yarns.

EFFECT OF SODIUM CHLORIDE CONCENTRATION. — Dyeings were made to show the affect of various concentrations of salt upon the dyeing properties. A dyeing made with no salt added to the bath showed practically no exhaustion, while that made with the maximum of 200% salt on the weight of the rayon

showed almost complete exhaustion. With an increase in the amount of sodium chloride used in the dye bath, there was an increase in the initial dyeing rate, the effect being the greatest with the lower concentrations of sodium chloride. As was well known, the equilibrium exhaustion also increased with an increase in the quantity of sodium chloride. Since the first amount of salt added has such a marked effect upon the dyeing rate, it is suggested that salt be added in increasing logarithmic quantities so as to give a slow, overall dyeing rate.

TYPE OF SALT.—The effect of the cation of the electrolyte in the dye bath was studied using equal molar concentrations of lithium, sodium and potassium chlorides. The initial rate of dyeing and the equilibrium exhaust values increased with an increase in the atomic weight of the cation.

YARN WEIGHT.—Dyeings were made with three to ten grams of rayon per 400 ml. of dye bath. The initial dyeing rate increased with the increase of weight of rayon in the dye bath and the equilibrium exhaust values also increased.

TEMPERATURE.—Dyeings were made at 50° C., 60° C., 70° C. and 80° C. which showed definitely that the initial rate of dyeing increased with an increase in temperature but the equilibrium exhaustion was less at the higher temperatures than at the lower temperatures.

DYE CONCENTRATION. — Dyeings were made at 90° C. using three different concentrations of dye. The results show that the initial rate of dyeing and the per cent exhaustion values decreased with an increase in dye concentration.

While some of this information is well known to the dyer in a practical way, these scientific dyeings show quantitatively what is taking place in the dye bath during the dyeing operation. They show exactly how rapid and how much dye is removed. When this information is compared with the color value of the dyed material, it is possible to determine the efficiency of the dyeing operation. The studies of the effect of the variations in manufacture on the dyeing properties of the rayon are of value to the maker of rayon so that he can produce material with greater uniformity in dyeing properties. It brings to the attention of the dyer the complications involved in the manufacture of rayon and the importance of using rayons of similar manufacture together if best uniformity of dyeings is to be obtained.

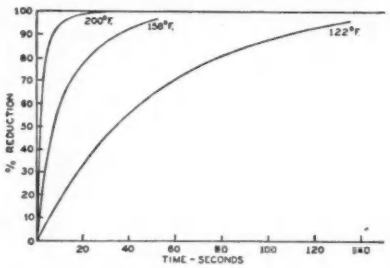


Figure 4. Reduction Curves for Calcoloid Yellow GCD Dbl. Pdr. Reductions in the Dyeometer at Various Temperatures.

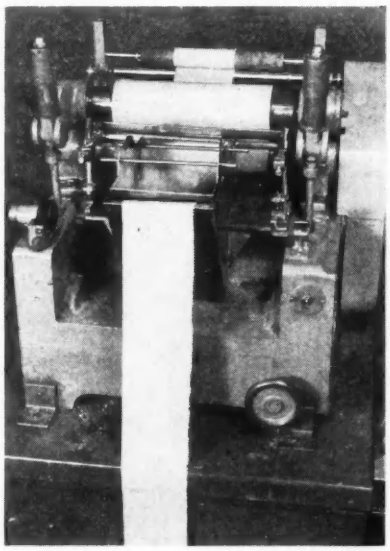


Figure 5. Continuous Dyeing Unit Mounted on a Laboratory Padder.

Vat Dyeing of Rayons

Vat dyeing is an important phase of any study of rayon dyeing. A number of papers have been published by our laboratories during the last few years on this subject and some of the high points of these relative to rayon dyeing will be emphasized. A paper by O. W. Clark *(4)* discusses some of the fundamental principles of vat dyeing. Data were presented on the general dyeing character of vat dyes showing their rapid rate of exhaust and high degree of exhaustion. This was illustrated by dyeing exhaustion curves made with the Dyeometer and also by exhibits of rayon skeins dyed by the method originally described by Boulton and Morton *(5)*.

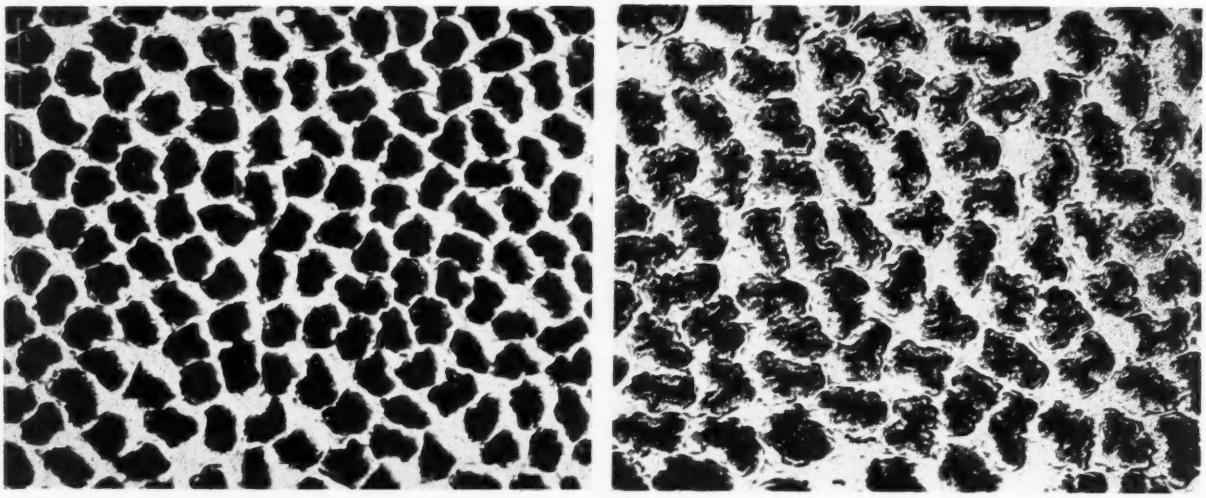
After showing the conditions which exist in the normal application of vat dyes, the paper describes method of modifying and controlling the dyeing behavior of vat dyes by the use of leveling assistants and the control of temperature. In the study of the effect of temperature on the reduction rate of vat dyes, it was brought out that most of the modern colloidal vat pastes and dispersed colloid powders reduce rapidly, even at low temperatures; and, as the temperature increases, the rate of reduction increases markedly. The paper by Kienle, Royer and McCleary *(3)* describes the method using the Dyeometer for the determination of the reduction rate of vat colors under definite temperature conditions. Fig. 4 shows an example of the data obtained by this method. The appendix of this paper published as Calco Technical Bulletin 792 gives a list of the times for reduction of a large number of vat colors at 200° F. This information on reduction rate at this high temperature is of interest for the continuous application of vat dyes at elevated temperatures.

In connection with this method of continuous dyeing, two papers have been published recently—one by O. W. Clark *(6)* on the selection of dyes for continuous pigment pad dyeing processes and the other by C. L. Zimmerman *(7)* on a laboratory apparatus for studying continuous dyeing.

The first paper discusses the important factors to be considered in selecting dyes for high temperature application methods from the viewpoint of speed of reduction, leuco stability and the affinity for the fiber. The second paper describes the construction of a laboratory apparatus which is suitable for studying continuous dyeing in liquid media at elevated temperatures. Fig. 5 shows a photograph of this apparatus attached to a laboratory padder. It can be used not only for matching shades but also for exploring variations in the dyeing procedures. In any continuous dyeing procedure, it is necessary to have information on the concentration of the dye needed in the developing bath in order to obtain consistent results. This information has been obtained in this laboratory machine and the appendix of Calco Bulletin No. 793 lists the relative bled-off data of a number of vat dyes at 200° F.

Solubility of Dyes

Relative solubility data are of considerable aid to the practical dyer of rayon. A greater use of continuous dyeing methods and changes in the design of dyeing machinery have increased the need for such data. In dyeing viscose rayon in the package machine or other types of pressure machines, very low liquor to fiber ratios are used and the maximum depth of shade which can be obtained depends upon the maximum concentration of dye



(a) No-skin. (b) Thick-skin.

Figure 6. Photomicrographs of Cross-sections of No-skin and Thick-skin Viscose Yarns.

in solution and this maximum concentration can be obtained from solubility data. A paper by Zimmerman and McCleary *(8)* discusses some of the theoretical aspects of solubility and a method for the practical determination of solubility. A proposed method for the determination of the solubility of commercial dyes is given and the appendix of this article published in Calco Technical Bulletin 801 lists the solubility of a large number of acid and direct dyes at 60° C.

Use of Microscopy in the Study of Rayon Dyeing

The microscope has been found to be of considerable value in the study of dyeing. The paper by Royer and Maresh *(9)* describes some general applications of microscopy to the textile industry. In connection with the study of rayon dyeing, it has been possible to use the microscope to identify fibers and, therefore, select the proper dyes. In applying the microscope to a study of the finished dyeings, it is possible to determine the penetration of the dye into the fabric and into the individual fibers as well as the distribution of the dye from fiber to fiber. This can be done by making cross sections of the material and examining these cross sections under the microscope. This distribution can be related to such properties as color values, solidness of shade, fastness to crocking, fastness to washing, fatness to light and levelness of dyeing.

In rayon dyeing the microscope and cross section technique have been used to study the initial take-up of vat or direct dyes by the removal of samples during the early stages of the dyeing so as to determine how quickly the dye penetrates. Studies have been made on the penetration of dye mixtures into rayon by cross sectional methods so as to reveal the qualitative differences in the rate of diffusion of various dyes in a mixture. Cross sections of rayon possessing the so-called skin show that in some cases the skin portion does not dye but the dye has penetrated through the skin and has dyed the center. (See figure 6 (a) and (b).). Various factors in the manufacture of rayon such as variation of stretch, ageing of the viscose, etc., have an effect upon the rate of the penetration of the dye into the rayon fiber and this can be observed microscopically.

A paper by Millson and Royer *(10)* shows the application of microscopical techniques to a study of union dyeing in which rayon was one of the fibers studied. By the use of cross sections, it was possible to determine which of the fibers in the mixture had taken up certain dyes and examination was made at various stages of the dyeing process so that transfer of the various dyes from one fiber to another could be observed. Examinations of materials dyed with so-called union dyes which dye more than one type of fiber, and materials dyed with dye mixtures made up of selected dyes which dye specific types of fibers make it possible to clarify and to correct some of the factors involved in union dyeing.

Acknowledgment

The work summarized in this paper represents the efforts of a number of people in the Calco laboratories and the author wishes to acknowledge their help and cooperation. It has been our hope that the scientific approach in the study of dyeing is of interest and value to the textile industry and that the practical man can do a better job as more and more information is given to him.

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All Correspondence Concerning the Employment Register Should Be Directed to the National Secretary

A Study of the Effect of Certain Variables on Gas Fading Tests Made Under Controlled Conditions

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CONTROLLED equipment which provides for entering small amounts of gases into a stream of conditioned air, which in turn is passed into a gas fading equipment, has been described by Ray *(5)*. This report covers an investigation of the effect of variations in rate of gas flow, in time of test, in temperature, in humidity, and in final heat treatment on gas fading analytical results, with the tests applied under controlled conditions. Oxides of nitrogen constituted the experimental gas used throughout this study.

Seibert *(8) (9)* has stated, on the basis of repeated tests with burner gases, that variations in moisture content of the air during a test may be the principal reason why the control does not change consistently to the color of the Standard of Fading. Under the Tentative Test Conditions, as outlined by the American Association of Textile Chemists and Colorists *(1)*, this investigator has found that the test can not be completed under 16 hours, with a maximum temperature of 140° F. (60° C.). If the air for testing is dehydrated, however, he finds the time reduced; with the temperature raised to 160-170° F., he has found that the test can be completed in eight hours or less. He has stated that it is recognized that testing temperatures below 140° F. represent actual air exposure conditions more closely than do higher temperatures; nevertheless, the control will change to the color of the Standard of Fading more consistently at 140° F. than at temperatures below; and testing at temperatures as high as 180° F. has produced satisfactorily reliable information in many tests conducted by this investigator. At these higher temperatures, however, closer attention to the details of testing is required for consistent reproducibility.

It is emphasized by Seibert that uniform distribution of the air from the burner within the space used for testing is very important. Failures in testing that have come to the attention of the author, have been due principally to this cause.

Greenspan and Spoerri *(3)* have found that fabrics dried to remove all moisture gave results similar to those with approximately a 6.5 per cent regain, but that the action was slower. These investigators used oxides of nitrogen instead of burner gases, as used by Seibert.

No humidity conditions approximating those in the atmosphere, and applied under controlled conditions have been reported.

Cady *(2)* has stated that desirable gas fading results are obtained at 50° C., approximately, provided the flow of gas is regulated. He has not given further specifications as to how the flow of gas was to be controlled.

It is the purpose of the investigation described in this report to study the chief variables associated with gas fading—namely, rate of gas flow, time of test, temperature, humidity, and after-exposure heat treatment, using the aforementioned equipment which permits the variables to be controlled. In preliminary studies it has been shown that conditions associated with the application of burner gases are difficult to control and that the test yields results only slowly. The use of synthetic gases, however, with oxides of nitrogen the most effective, have enabled the test to be accelerated and more carefully controlled. The latter is used as the gas for this study.

Methods of Procedure

TEST CASES.—In a previous paper by these same authors *(7)*, it has been shown that sulfur dioxide produces little fading or color change in textile fabrics which are amenable to gas fading, the oxides of nitrogen produce notable gas fading comparable to that produced in use, and that sulfur dioxide mixed with oxides of nitrogen produce less color change than the same concentration of the latter used alone. In this investigation, therefore, oxides of nitrogen were used as the experimental gas.

TEST FABRICS.—Six test fabrics representing various degrees of sensitivity to gas fumes were used in this study.

These fabrics are described as follows:

Fabric Number 1. Control 1—Cellulose acetate satin fabric dyed with 1.0 per cent Celanthrene Brilliant Blue FFS;

Fabric Number 2. Control 2—Cellulose acetate satin dyed with 0.6 per cent Eastone Blue BB;

Fabric Number 3. Control 3—Cellulose acetate satin dyed with 0.8 per cent Setacyl Direct Blue GD;

Fabric Number 4. Blue Crepe of viscose and cellulose acetate rayon, dyed with direct dyes;

Fabric Number 5. Green crepe of viscose and cellulose acetate rayon, dyed with direct dyes;

Fabric Number 6. Blue gabardine of spun viscose, dyed with direct dyes.

The first three fabrics, specified as controls, consisted of swatches dyed according to a slightly modified version of a procedure recommended in the 1945 Yearbook of the Association of Textile Chemists and Colorists *(1)*, in connection with a gas fading test. The first is highly susceptible to gas fading, and the second and third are increasingly more resistant to this type of color change. Fabric Numbers 4, 5, and 6 are consumer fabrics chosen after preliminary studies, likewise to represent three degrees of resistance to gas fading, with Number 4 the least and Number 6 the most resistant.

APPARATUS.—Descriptions and complete illustrations of the gas fading chamber, the air-conditioning apparatus, and the equipment for feeding the gas has

* Deceased March 1, 1947.

been given in a previous report by Ray *(5)*.

The gas-feeding equipment for oxides of nitrogen was adapted for various rates of flow, by changing the length of the 0.37 mm.-bore capillary tube which was used.

CONDITIONS RECORDED.—The conditions recorded periodically throughout all of the tests were as follows:

(a) dry and wet bulb temperatures in the oven at half-hour intervals (bases for determining absolute humidity and percentage relative humidity);
(b) temperature of gas at hourly intervals (assumed to be the same as the water surrounding the gas flask);
(c) atmospheric pressure;
(d) pressure of gas (difference from atmospheric measured by means of manometer);
(e) total amount of liquid used to displace gas;
(f) length of test.

Because the rate of air flow was kept constant at 11 cubic feet per hour, this was not recorded during these tests.

With reference to item (e), the amount of liquid consumed during a run was determined by measuring the amount of liquid required to refill the bottle used for maintaining a constant level.

The amount of dry gas used (measured at standard conditions) was estimated by applying corrections for absorption, temperature of gas, pressure of gas, and pressure of water vapor to the total amount of water used during a test to displace the gas.

The following formula was used:

$$V_2 = V_1 \times 0.96 \times \frac{273}{T} \times \frac{P - P_v}{29.92}$$

where V_1 = volume of gas under conditions used
V_2 = volume of gas measured at standard conditions
T = temperature of gas (degrees Kelvin)
P = pressure of gas (inches of mercury)
P_v = pressure of water vapor at given temperature

The rate of gas flow (c.c. per hour) was determined by dividing the total quantity of gas used (c.c. at standard conditions) by the length of the test.

PREPARATION AND HANGING OF THE TEST SPECIMENS.—The specimens used for testing were cut five and three-quarters inches in the warp and five inches in the filling direction. Hems for insertion of glass rods were basted at each end, leaving a finished length of four and one-half to four and five-eighths inches. Duplicate specimens of each fabric were prepared for each set of test conditions. These were exposed on consecutive runs, making it possible to check reproducibility of results.

Immediately before the specimens were placed in the oven, they were ironed separately for 10 seconds under a closely woven cotton cloth, using an iron temperature maintained from 105 to 110° C. This was done not only for the purpose of removing wrinkles, but also to bring the test specimens to a similar residual moisture content before exposure to any set of conditions.

In order to eliminate any error resulting from small variations in fading throughout different parts of the oven, each test fabric always was suspended from the same rod throughout this part of the study. Preliminary experiments, however, had shown that the variation in color of specimens of Control 1 throughout the oven after moderate to severe exposure was under 7.0 per cent, as measured by reflectometer readings and calculated as units of color difference.

Six rods were used in the oven as follows:

Rod 1. Control 1 (Fabric Number 1).
Rod 2. Blue Crepe (Fabric Number 4).
Rod 3. Control 2 (Fabric Number 2).
Rod 4. Green Crepe (Fabric Number 5).
Rod 5. Control 3 (Fabric Number 3).
Rod 6. Blue Gabardine (Fabric Number 6).

PROCEDURE FOR EQUIPMENT OPERATION.—After the specimens were placed in the oven, the equipment was prepared for the test as follows:

(a) First, the air-heating pipe and then the oven were brought to the desired temperature range, using the maximum wattage during this preliminary heating period, then cutting down to the amount required for maintaining the desired temperature. For the former the temperature was kept at least 55° C. above the saturation temperature to be maintained in the humidification pipe, because it had been estimated as a result of previous tests that the air lost approximately this much temperature between the air pipe thermometer and the oven.

Switch combinations for various oven heats have been given in a previous report describing the controlled equipment *(4)*.

(b) During Step (a), the water was heated for steam (where a high humidity was to be used); the water was started through both condensers, the oven fan was connected, and the suction and blowers were started.

(c) When the oven had reached the desired temperature, and when the water supplying steam had started to boil (in cases in which steam was used) the water heaters required for the desired set of temperature and humidity conditions were connected. Specific procedures which were followed to obtain the two specific relative humidity levels (50 and 15 per cent) at two different temperatures (55 and 65° C.), respectively, are given in Table I.

During the low temperature exposure a humidity of 30 ± 5 per cent was maintained by using cold water in the condenser.

The specimens then were allowed to condition for one hour, during which time their moisture content was assumed from previous determinations to approach equilibrium. During the first part of this period the oven humidity had been found to come to equilibrium.

(d) During the one-hour conditioning period, the gas-fading apparatus was prepared for the test (see diagram of gas-fading apparatus in report by Ray *(4)* on the development of a controllable gas fading equipment).

The bucket surrounding the flask of gas was filled with water at 25° C. The water then was maintained between 24 and 25° C. throughout the test.

A few minutes before time to start the flow of gas, the pressure was checked by means of the manometer and adjusted if necessary. It usually was lower than atmospheric because of a small amount of absorption of the gas by the water in the flask. The pressure was increased by gradually entering water into the flask through a funnel and stopcock provided for that purpose. The pressure was raised just sufficiently to allow a bubble of gas to come to the surface of the water in the trap bottle.

(e) After the one-hour conditioning period and the preparation of the gas-feeding apparatus, the pinch clamp at the oven end of the gas feed was removed and the flow of gas started by opening the stopcock leading from the constant level device, and the one leading from the gas flask.

(f) At the close of each test period, the pinch clamp and all stopcocks in the gas-fading apparatus were closed. All air and water-heating devices were disconnected.

After the specimens were re-

TABLE I

Record of Conditions During Exposure of Fabrics to Various Compositions of Gases

Test Code	Length of Test (Hours)	Oven Temperature (° C)	Oven Humidity		Atmospheric Pressure (Inches of Mercury)	Pressure of Gas (Inches of Mercury)	Total Amount of Liquid Used to Displace Gas (cc.)	Total Amount of Gas Used at Standard Conditions (cc.)	Rate of Gas at Room Conditions (cc. per Hour)	Rate of Gas at Standard Conditions (cc. per Hour)
			Absolute (Pounds water per pound dry air)	Relative (Per Cent)						
A-1	5	55 ± 2.5	0.060	55 ± 5	29.75	29.81	242	203	50	41
A-2			0.060		29.78	29.84	230	194		39
B-1	2-1/4	55 ± 2.5	0.059	55 ± 5	29.66	29.68	260	219	115	97
B-2			0.054		29.74	29.76	264	208		92
C-1	2	55 ± 2.5	0.053	50 ± 5	30.08	30.11	200	172	100	86
C-2			0.051		29.66	29.69	200	169		85
D-1	2	55 ± 2.5	0.016	15 ± 3	30.05	30.08	200	172	100	86
D-2			0.014		29.88	29.91	198	169		85
E-1	2	65 ± 3.5	0.082	50 ± 5	29.65	29.68	196	166	100	83
E-2			0.080		29.57	29.60	196	166		83
F-1	2	65 ± 3.5	0.027	15 ± 3	30.07	30.10	200	171	100	86
F-2			0.027		30.01	30.04	196	168		84
P-1	2	30 ± 2.0	0.009	30 ± 3	29.88	29.88	192	164	100	82
P-2			0.009		29.89	29.89	191	163		82
S-1	1-1/3 (80 minutes)	55 ± 2.5	0.013	15 ± 3	29.90	29.94	134	114	100	86
S-2			0.013		29.78	29.82	128	109		82
R-1	2/3 (40 minutes)	55 ± 2.5	0.012	15 ± 3	29.92	29.76	64	55	100	83
R-2			0.011		29.76	29.80	69	58		87

TABLE II

Relationship of Rate of Consumption of Oxides of Nitrogen, and Time of Test to Color Change in Gas Fading Tests, with Total Gas Consumption Constant

(Total Gas Consumption 250 c.c. at Room Temperature, or 206.5 ± 12.5 c.c. per Test at Standard Conditions of Temperature and Pressure: Temperature 55 ± 2.5° C: Relative Humidity 55 ± 5.0 per cent.)

Test A — Gas Flow 50 c.c. per Hour (40 ± 1 c.c. at Standard Conditions) Time of Test 5 Hours

Test Fabrics	Visual Rating (Class)	Units of Color Difference (Average)	Description of Change
Fabric Number 1 (Control 1)	IV	52.2 ± 1.0	Changed from blue to pink, far more intense than standard of fading of A.A.T.C.C.
Fabric Number 2 (Control 2)	III	8.8 ± 0.5	Changed from blue to grey-blue with pink cast
Fabric Number 3 (Control 3)	I	1.6 ± 0.1	No visible fading or color change
Fabric Number 4 (Blue Crepe)	IV	7.7 ± 0.0	Changed from blue to dull blue with notable fading
Fabric Number 5 (Green Crepe)	IV	5.8 ± 0.3	Changed from green to lighter green with a yellow cast
Fabric Number 6 (Blue Gabardine)	I	1.2 ± 0.2	No visible fading or color change

Test B — Gas Flow 115 c.c. per Hour (95 ± 3.0 c.c. at Standard Conditions) Time of Test 2¼ Hours

Test Fabrics	Visual Rating (Class)	Units of Color Difference (Average)	Description of Change
Fabric Number 1 (Control 1)	IV	72. ± 0.0	Changed from blue to pink, far more intense than standard of fading of A.A.T.C.C.
Fabric Number 2 (Control 2)	IV	20.2 ± 0.3	Changed from blue to dull pink
Fabric Number 3 (Control 3)	II	7.6 ± 0.4	Slight dulling of original blue
Fabric Number 4 (Blue Crepe)	IV	12.1 ± 0.0	Changed from blue to dull pink
Fabric Number 5 (Green Crepe)	IV	7.5 ± 0.0	Changed from green to yellow green
Fabric Number 6 (Blue Gabardine)	I	0.3 ± 0.2	No visible fading or color change

moved, the suction and blower were left in operation and the water was left flowing through both condensers for a period of at least 15 minutes. The purpose of this procedure was to clear the oven and hot-air pipe of gas and excessive moisture. The door was left open between tests.

DETERMINATION OF COLOR CHANGES. — *Visual Evaluation.* — Original and exposed specimens were placed on a gray mounting board (45° angle) in a black cabinet under a light having a color temperature of 2780° K. In this arrangement, the eyes of the observer were approximately at right angles to the specimens, and the light shone from one side at an angle of about 30° from the line of vision of the observer.

Fabrics were judged for color change and classified as follows:

Class I—No observable fading;

Class II—Only slight fading;

Class III—Some fading, but not sufficient to render a garment unfit for further use;

Class IV—Severe fading, sufficient to render a garment unfit for further use.

Standard sets of faded swatches of different colors were used in an effort to maintain as close uniformity as possible in making judgments.

Reflectometer Readings and Color Difference Calculations.—Reflectancy readings were made on the upper and lower areas of each exposed fabric by the use of the Hunter reflectometer. The reflectancy of an original unexposed specimen of each fabric was measured at the same time.

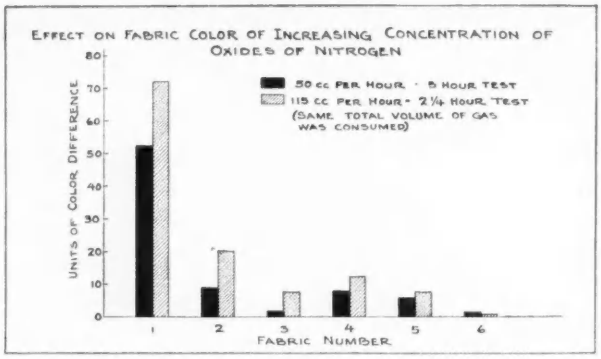
EFFECT ON FABRIC COLOR OF INCREASING CONCENTRATION OF OXIDES OF NITROGEN
50 cc PER HOUR - 5 HOUR TEST
115 cc PER HOUR - 2¼ HOUR TEST
(SAME TOTAL VOLUME OF GAS WAS CONSUMED)
UNITS OF COLOR DIFFERENCE
FABRIC NUMBER

Figure 1

TABLE III

Relationship of Total Gas Consumed and Time of Test to Color Change in Gas Fading Tests, with Rate of Gas Flow Constant
(Temperature 55 ± 2.5° C., Relative Humidity 15 ± 3 Per Cent. Rate of Gas Flow 100 c.c. per Hour)

Test D	Time of Test: 2 Hours		
Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	69.8 ± 0.5	Change from lighter blue with pink cast
Fabric Number 2 (Control 2)	IV	17.1 ± 0.6	Change from lighter blue with pink cast
Fabric Number 3 (Control 3)	II	5.6 ± 0.2	Change from blue to lighter, duller blue
Fabric Number 4 (Blue Crepe)	IV	15.9 ± 0.4	Change from blue to duller blue with pink cast
Fabric Number 5 (Green Crepe)	IV	10.7 ± 0.8	Change from green to yellow-green
Fabric Number 6 (Blue Gabardine)	I	0.8 ± 0.3	No visible fading or color change
Test S	**Time of Test: 80 Minutes**		
Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	61.2 ± 2.0	At least twice as faded as standard
Fabric Number 2 (Control 2)	III	13.4 ± 0.4	More of a pink cast
Fabric Number 3 (Control 3)	II	4.0 ± 0.0	Lighter, duller
Fabric Number 4 (Blue Crepe)	IV	13.7 ± 2.0	Duller, pink
Fabric Number 5 (Green Crepe)	IV	8.7 ± 0.3	About twice as faded as R
Fabric Number 6 (Blue Gabardine)	I	0.6 ± 0.5	No change
Fabric Number 7 (Blue-green Crepe)	IV	x	Pink, very similar to normal exposure
Test R	**Time of Test: 40 Minutes**		
Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	38.9 ± 5.3	Duller, pink cast, a little more faded than standard
Fabric Number 2 (Control 2)	II	7.6 ± 0.9	Pink cast
Fabric Number 3 (Control 3)	I	1.1 ± 0.3	Very little, if any change
Fabric Number 4 (Blue Crepe)	III	7.9 ± 2.5	Duller, pink cast
Fabric Number 5 (Green Crepe)	III	4.1 ± 1.3	Lighter, yellow-green
Fabric Number 6 (Blue Gabardine)	I	1.1 ± 0.0	No change
Fabric Number 7 (Blue-green Crepe)	II	x	Very slight pink cast

Using the reflectancy readings on the blue, amber, and green filters of this instrument, units of color difference were calculated by means of the formula for △ E, derived by Hunter *(4)*.

VARIABLES STUDIED—*Variation of Rate of Gas Flow.*—Rates of gas flow of 50 and 115 c.c. per hour were studied under the conditions noted, with the time of the test adjusted so that approximately the same total amount of gas was used in each set of tests. These are designated as Tests A and B, respectively, in the tables of experimental data which follow.

Variation in the Time of the Test.—With the rate of gas flow, temperature, and relative humidity approximately constant, three times of testing were studied as follows:

Test D. two hours (120 minutes);

Test S. one and one-third hours (80 minutes);

Test R. two-thirds hour (40 minutes).

The constant conditions of this test were: rate of gas flow under room conditions: 100 c.c. per hour; oven temperature: 55 ± 2.5° C.; oven humidity: 15 ± 3 per cent.

Variation in the Humidity.—Relative humidities of 50 ± 5 and 15 ± 3 per cent were studied, each at two temperatures 65 ± 3.5° C. and 55 ± 2.5° C., respectively. Other conditions of the test were: rate of gas flow at room conditions 100 c.c. per hour; time of test: 2 hours (Tests D, C, F, and E).

Variation in Temperature.—Temperatures of 55 ± 2.5° C. and 65 ± 3.5° C. were investigated at the two relative humidity conditions 15 ± 3 and 50 ± 5 per cent, respectively. The other conditions were those outlined in the previous paragraph.

One test was made at room temperature (i.e., without use of the heating part of the apparatus), and at a relative humidity of 30 ± 3 per cent (Test P).

The number of possible combinations of the aforementioned variables was limited by such practical considerations as the fact that certain conditions could not be maintained simultaneously. Particularly was this true of temperature and relative humidity.

Variations in Heat Treatments Following Exposure.—Two different heat treatments were given to portions of each fabric exposed to oxides of nitrogen at room temperature, as described in a previous paragraph (Test P). In the first treatment, an iron at a temperature of 105° C. was placed on the lower one-half of each specimen for 20 seconds. The second treatment consisted of suspending the upper one-half of each specimen in the oven for 45 minutes. During the first 15 minutes of the period involved in the second treatment, the oven was brought up to a tem-

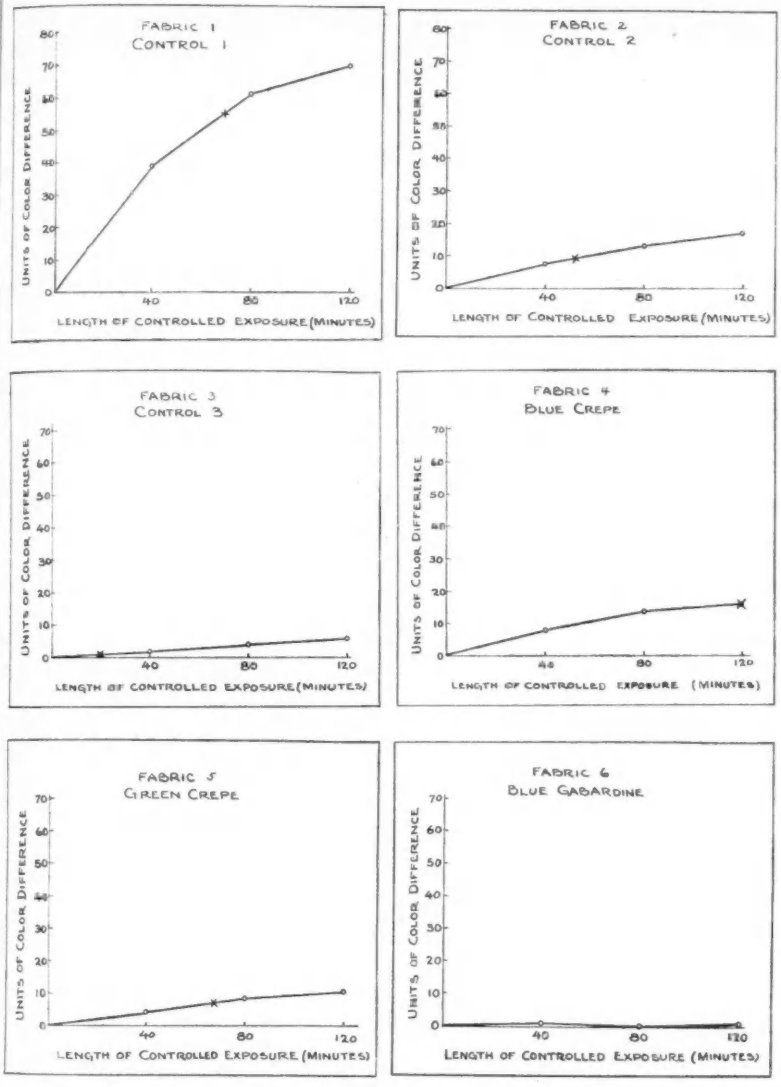

Figure 2

Note: The graphs proper represent the fading at the specified times under controlled conditions. The position of (X) in the graphs shows the units of color difference after two tests according to the American Association of Textile Chemists and Colorists under uncontrolled conditions.

TABLE IV

Relationship of Temperature and Relative Humidity to Color Change in Gas Fading Tests With Time and Rate of Gas Flow Constant

(Time of Test 2 Hours; Rate of Gas Flow Under Room Temperature 100 cc. per hr.)

Test D Temperature 55 ± 2.5° C. Per Cent Relative Humidity 15 ± 3.0

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	69.8 ±0.5	lighter, pink
Fabric Number 2 (Control 2)	IV	17.1 ± 0.06	lighter, pinkish blue
Fabric Number 3 (Control 3)	II	5.6 ± 0.2	lighter, duller
Fabric Number 4 (Blue Crepe)	IV	15.9 ± 0.4	darker, duller, pink cast
Fabric Number 5 (Green Crepe)	IV	10.7 ± 0.8	lighter, yellow cast
Fabric Number 6 (Blue Gabardine)	I	0.8 ± 0.3	No change

perature of 55 ± 2.5° C., and then was maintained at this temperature of 30 minutes. The relative humidity during this period was 30 ± 5 per cent.

All of the above specimens were allowed to stand for 15 minutes following the conclusion of the test, after which visual evaluations and reflectometer readings (as a basis for color difference calculations) were made.

Presentation of Data

Table I gives a record of the variables which were held relatively constant during the respective tests used in this investigation. These include time, temperature, humidity, atmospheric and gas pressures, and total gas consumption data.

Table II and Fig. 1 give the results on color-fastness of two tests in which the rate of gas flow and the time of the test were varied, although the total amount of consumed gas was approximately the same.

Table III and Figure 2 show the results obtained with three times of exposure, with all other conditions kept constant.

Table IV as well as Figure 3 give the data from two relative humidity conditions, each at two temperatures.

Table V gives the results of one test made under room temperature conditions, with a relative humidity of 30 ± 3 per cent.

Table VI and Figure 4 present the color change effectuated by different heat treatments following original exposure in the gas fading oven.

Discussion of Findings

EFFECT OF RATE OF GAS FLOW.—The data in Table II show conclusively that, even with the same total amount of gas, far more severe results accrue when a higher rate of flow of gas is applied for a shorter period of time, all other conditions remaining the same.

EFFECT OF TIME OF TEST.—When the rate of gas flow was held constant, and the time of the application of gases, and hence the total gas consumption was varied, on the other hand, the amount of fading or color change became progressively more intense the greater the time and the greater the total gas consumption. (see Table III and Figure 2).

All color changes were more severe with oxides of nitrogen than with burner gas for the same period or even considerably longer periods of time. The use of the synthetic oxides of nitrogen produces the same type of fading as the burner gases, however, which indicates that this is at least the major active ingredient in the burner gas. The use of the more concentrated oxides of nitrogen therefore

TABLE IV (Continued)

Test C Temperature 55 ± 2.5° C. Per Cent Relative Humidity 50 ± 5.0

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	68.2 ± 0.0	lighter, pink
Fabric Number 2 (Control 2)	IV	16.2 ± 1.5	lighter, pinkish blue
Fabric Number 3 (Control 3)	II	4.7 ± 0.2	lighter, duller
Fabric Number 4 (Blue Crepe)	IV	12.2 ± 0.0	darker, duller, pink cast
Fabric Number 5 (Green Crepe)	IV	7.2 ± 0.3	lighter, yellow cast
Fabric Number 6 (Blue Gabardine)	I	0.8 ± 0.3	No change

Test F Temperature 65 ± 3.5° C. Per Cent Relative Humidity 15 ± 3.0

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	69.3 ± .0.0	yellowish pink
Fabric Number 2 (Control 2)	IV	20.2 ± 0.2	lighter pink
Fabric Number 3 (Control 3)	III	6.7 ± 0.5	lighter, duller, more faded
Fabric Number 4 (Blue Crepe)	IV	17.8 ± 1.4	very distinct pink cast
Fabric Number 5 (Green Crepe)	IV	11.1 ± 0.4	yellow cast
Fabric Number 6 (Blue Gabardine)	I	1.1 ± 0.0	No change

Test E Temperature 65 ± 3.5° C. Per Cent Relative Humidity 50 ± 5.0

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	71.1 ± 0.3	lighter, yellowish pink
Fabric Number 2 (Control 2)	IV	17.0 ± 0.7	lighter, pinkish blue
Fabric Number 3 (Control 3)	III	4.7 ± 0.2	lighter, duller
Fabric Number 4 (Blue Crepe)	IV	12.4 ± 0.9	lighter, duller, pink cast
Fabric Number 5 (Green Crepe)	IV	6.3 ± 0.2	lighter, yellow cast
Fabric Number 6 (Blue Gabardine)	I	0.8 ± 0.3	No change

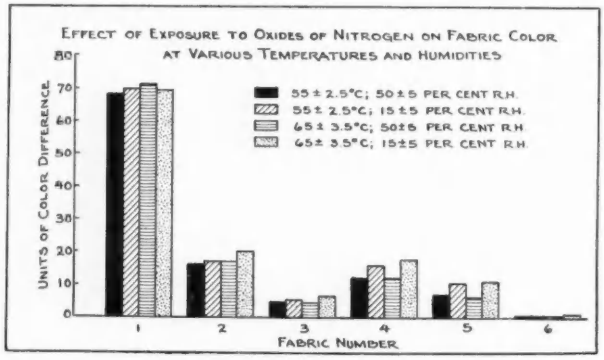

Fig. 3

has materially aided in accelerating the gas fading test in this study.

EFFECT OF TEMPERATURE AND RELATIVE HUMIDITY.—When the relative humidity was held constant at 15 ± 3 per cent the gas fading results were generally very slightly higher, although there was no difference with the most sensitive fabric (Fabric 1), and no marked differences with the other fabrics. At a relative humidity of 50 ± 3 per cent, there were slightly greater color changes with the two most sensitive fabrics, but no notable changes for the others. All in all, however, the differences in results between these two temperatures was such as to make little difference in which is used. (see Table IV, and Figure 3).

When the temperature was held constant at 55 ± 2.5° C., the lower humidity gave very slightly greater color changes than the higher humidity. At the higher of the two temperatures, the lower humidity gave somewhat greater fading results than the higher, except with the most and the least sensitive fabric, in which cases there were no differences between the two humidities.

Where any differences occurred (Fabrics 2, 3, 4, and 5) the greatest change was found with the higher of the two temperatures and the lower of the two humidities (65 ± 3.5° C. and 15 ± 3 per cent relative humidity). Since almost as great changes occurred at 55 ± 2.5° C. and 15 ± 3 per cent relative humidity, either of these combinations is suggested as satisfactory for an accelerated gas fading test. The 55 ± 2.5° C. and 15 ± 3 per cent relative humidity conditions have the advantage of representing a combination which may be more readily maintained than the 65 ± 3.5° C. and 15 ± 3 per cent relative humidity.

One possible explanation of the greater effectiveness of the lower humidity may lie in the possibility that, with higher amounts of moisture in the air, the gases reacted more readily with the brass pipe leading into the oven. Visual examination of the interior of the pipe indicated that this may have been the case. This would effectively reduce the quantity of destructive gases which would enter the oven. Without further investigation, therefore, particularly with equipment in which all parts coming in contact with the destructive gas are made of non-reactive material, these results are applicable solely when the equipment as described has been employed.

In one test conducted at room temperature (30 ± 2.0° C.) and at a humidity which readily can be maintained at this temperature (30 ± 3 per cent), results were obtained which almost equalled or exceeded very slightly those with the higher temperatures (see Table V). This

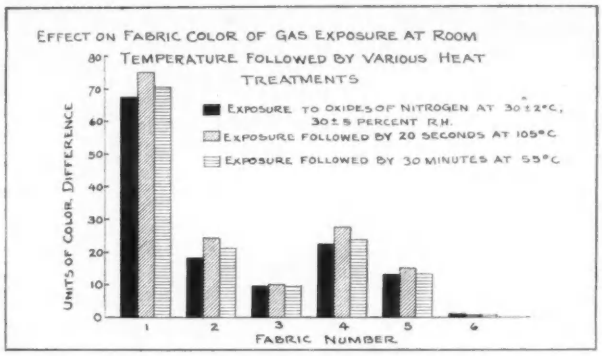
EFFECT ON FABRIC COLOR OF GAS EXPOSURE AT ROOM TEMPERATURE FOLLOWED BY VARIOUS HEAT TREATMENTS
EXPOSURE TO OXIDES OF NITROGEN AT 30±2°C, 30±5 PERCENT R.H.
EXPOSURE FOLLOWED BY 20 SECONDS AT 105°C
EXPOSURE FOLLOWED BY 30 MINUTES AT 55°C
UNITS OF COLOR DIFFERENCE
FABRIC NUMBER

Fig. 4

TABLE V

The Effects of the Oxides of Nitrogen on Fading at Room Temperature (Temperature 30 ± 2.0° C.; Per Cent Relative Humidity 30 ± 3; Time of test 2 hrs.)

Test P.

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	67.8 ± 1.4	dull pink
Fabric Number 2 (Control 2)	IV	18.1 ± 0.7	lighter, pink cast
Fabric Number 3 (Control 3)	III	9.6 ± 1.0	lighter, duller, slight greenish cast
Fabric Number 4 (Blue Crepe)	IV	22.4 ± 0.3	very dull pinkish brown
Fabric Number 5 (Green Crepe)	IV	13.0 ± 0.2	yellowish green
Fabric Number 6 (Blue Gabardine)	I	1.0 ± 0.0	no change

TABLE VI

Effect of Oxides of Nitrogen at Room Temperature Followed By Various Heat Treatments on Fading (Temperature 30 ± 2° C.; Per Cent Relative Humidity 30 ± 5; Rate of Gas Flow 100 cc. per Hour)

Test P (a) Before Heat Treatments

Test Fabrics	*Visual Rating (Class)*	*Units of Color Difference (Average)*	*Description of Change*
Fabric Number 1 (Control 1)	IV	67.8 ± 0.4	dull pink
Fabric Number 2 (Control 2)	IV	18.1 ± 0.7	lighter, pink cast
Fabric Number 3 (Control 3)	III	9.6 ± 1.0	lighter, duller, slight greenish cast
Fabric Number 4 (Blue Crepe)	IV	22.4 ± 0.3	very dull pinkish brown
Fabric Number 5 (Green Crepe)	IV	13.0 ± 0.2	yellowish green
Fabric Number 6 (Blue Gabardine)	I	1.0 ± 0.0	no change

gives another possible combination of temperature and humidity conditions suitable for an accelerated aging test. With the equipment as designed, however, the easiest to maintain of the combinations studied was 55 ± 2.5° C. and 15 ± 3 per cent relative humidity.

Effect of Two Types of Heat Treatments Following Gas Fading Exposure.—Table VI and Figure 4 show that two types of heat treatments, namely—20 seconds of contact with an iron maintained at 105° C., and 30 minutes in an oven (without a flow of gas) at 55° C., respectively, produce no additional change which can be observed visually. When reflectometer readings were made, however, the gas fading results were slightly intensified, with the shorter treatment with the iron at 105° C. giving somewhat greater changes than the longer oven treatment at 55° C. Even with the iron, however, the change was so slight that the addition of this treatment to the accelerated oven treatments is not warranted. In the case of the slower tests using burner gases, the after-treatment with heat accentuates a test in which the oven results are not very great. With the accelerated test made under controlled conditions as described in this series of reports, however, there is no particular advantage in the after-treatment with heat.

Since there is a gradual spontaneous change in the fabric after the oven treatment, a definite, uniform time of evaluating the color changes after removal from the oven is desirable. From a series of tests on the optimum time it was found that any fixed time from 2 to 24 hours gives good results. In the laboratory at the Ellen H. Richards Institute, a period of 3 hours after removal from the gas fading oven has been adopted as the standard time for making color evaluations on test fabrics.

Summary

It was found that the gas fading test could be greatly accelerated by the use of oxides of nitrogen in larger quantities than those possible with the use of combustion gases. The constant levelling device adopted for controlling the flow of oxides of nitrogen in this part of the study gave uniform rates from a practical point of view.

When the total amount of gas used was kept constant, shorter exposure periods with a higher concentration of gas caused more severe fadings than longer periods with a lower concentration of gas.

With the use of the type of controlled equipment employed in this investigation, a relative humidity of 15 per cent caused somewhat more fading in a given time than one of 50 per cent, with all other factors constant, at the two temperatures of 55° C. and 65° C. When a low humidity was used, exposures at 65° C. were slightly more severe than those at 55° C. A combination of 30° C. (no heat added) and 30 per cent relative humidity gave results comparable to those obtained at the two named higher temperatures and a relative humidity of 30 per cent.

Ease of operation of the equipment used in this study, however, favored the adoption of 55° C. and 15 per cent relative humidity for a standard accelerated test procedure.

The high degree of fading found at 30° C. and 30 per cent relative humidity showed the need for further investigations at low temperatures. The greater fading at 15 rather than at 50 per cent relative humidity seemed to be associated with some reaction of the destructive

TABLE VI (Continued)

Test P (b) After 20 seconds at 105° C.

Test Fabrics	Visual Rating (Class)	Units of Color Difference (One Test)	Description of Change
Fabric Number 1 (Control 1)	IV	75.2	more orange than (a)
Fabric Number 2 (Control 2)	IV	24.2	slightly lighter than (a)
Fabric Number 3 (Control 3)	III	10.0	slight pinkish cast
Fabric Number 4 (Blue Crepe)	IV	27.8	Much more orange than (a)
Fabric Number 5 (Green Crepe)	IV	14.9	slightly more faded than (a)
Fabric Number 6 (Blue Gabardine)	I	0.5	no change

Test P (c) After 30 minutes at 55° C.

Test Fabrics	Visual Rating (Class)	Units of Color Difference (One Test)	Description of Change
Fabric Number 1 (Control 1)	IV	70.7	less changed than (b)
Fabric Number 2 (Control 2)	IV	21.2	slightly lighter than (a)
Fabric Number 3 (Control 3)	III	9.5	very little change from (a)
Fabric Number 4 (Blue Crepe)	IV	23.9	less hanged than (b)
Fabric Number 5 (Green Crepe)	IV	13.2	similar to (b)
Fabric Number 6 (Blue Gabardine)	I	0.5	no change

gases with the lining of a part of the equipment at the higher temperature; this indicates the desirability of continuing the investigation with non-reactive materials in parts of the equipment with which the gas comes in contact.

It was observed that the samples continued to fade for a few hours or more after they were removed from the exposure chamber containing oxides of nitrogen. This shows the importance of adopting a standard time period between exposure and evaluation for color change.

Heat treatments applied to specimens after exposure increased the color changes on sensitive fabrics only slightly when the accelerated test employing oxides of nitrogen was used.

Acknowledgment

Sincere appreciation is expressed:

To The American Viscose Corporation, under whose sponsorship this investigation was conducted at The Ellen H. Richards Institute, The Pennsylvania State College; and

To Charles A. Seibert, Textile Colorist, E. I. duPont de Nemours and Company, for consultation concerning various aspects of the problem based on his extensive experience with gas fading test procedures.

This is the sixth in a series of reports on methodology studies related to gas fading, from the laboratories of the Ellen H. Richards Institute sponsored by the American Viscose Corp.

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Evaluation of Crease Resistance

(Continued from Page 518)

PERFORMANCE OF CREASE RESISTING FINISHES AT HIGH HUMIDITY.—The performance of several crease resisting resins was studied at standard

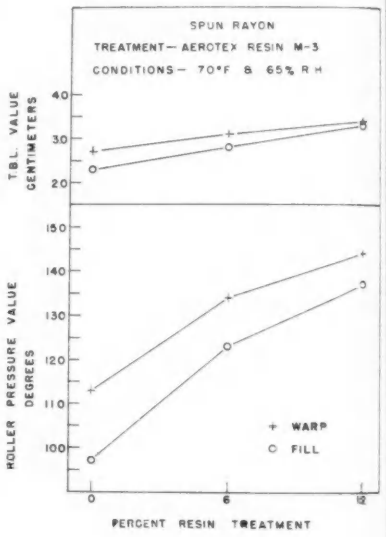

Fig. 17. Roller Pressure and T.B.L. test data compared. Material is spun rayon treated with indicated amounts of melamine resin.

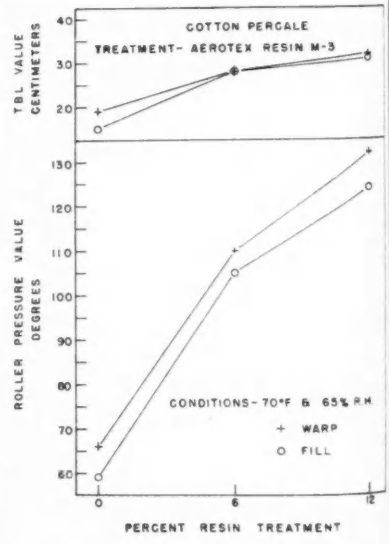

Fig. 18. Roller Pressure and T.B.L. test data compared. Material is cotton percale treated with indicated amounts of melamine resin.

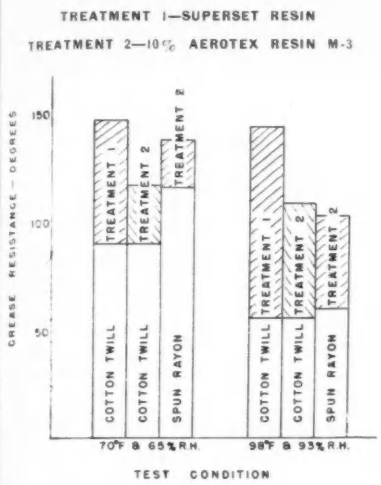

Fig. 19. Effect of humid conditions upon crease resistance of cotton and rayon. Tests performed by Roller Pressure method.

conditions and at the conditions chosen to simulate humid summer weather. The data are illustrated by the bar graph of Figure 19, which records the roller pressure data. The total height of the bars represents the crease resistance with the resin treatments while that of the untreated materials is indicated by the unshaded portion; the shaded area therefore shows the improvement obtained by treatment.

Several interesting facts are disclosed by these charts. The humid condition has little effect on the crease resistance of resin treated cotton twill, however the untreated cloth undergoes a sharp reduction in resistance to creasing in this condition. Both untreated and resin treated spun rayon are adversely affected by the humid atmosphere, the untreated more severely, however. The value of the crease resisting properties of these resins at conditions simulating humid summer weather is thus borne out. Their merit in reducing wrinkling is more evident in a humid atmosphere than at normal conditions.

Conclusions

It is hoped that the information included in this paper may aid somewhat in the problem of evaluating crease resistant finishes. Although a rigorous scientific approach to the problem is not claimed, and the data are more illustrative than complete, the several new features of the roller pressure testing apparatus are believed to have advantages in assessing the benefits of finishing treatments. Some of the more common difficulties encountered in this kind of testing can be reduced or avoided by its use.

We wish to acknowledge the assistance obtained from Dr. J. E. Lynn and L. A. Fluck of the Textile Chemicals Laboratory and thank them for their helpful suggestions and cooperation in supplying the materials involved. We are also indebted to other members of the American Cyanamid Company who, through their interest and assistance, have aided in this work.

References

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• PATENT DIGEST •

Discharge Pastes on Acetate of Cellulose—Non-alkaline Pastes

D. 2, 02

U. S. Pat. 2,435,658

(Celanese Corp., Seymour-Ward-Hunter, February 10, 1948)

The usual alkaline discharge pastes (white as well as colored ones) are not suitable for printing on acetate of cellulose. First of all this material undergoes saponification by the action of alkalies and consequently the fibers are liable to become tendered to a certain degree. Moreover some of the blue dyestuffs, just the brands used especially because of their resistance to gas fading, cannot be discharged pure white and consequently also the colored discharges become dull. Alkaline discharge pastes are therefore undesirable. A satisfactory discharging method has been developed according to the present specification. Clear untinted white and bright colored discharges can be obtained by using sulfuric acid esters of leuco vat dyestuffs (Indigosols) as dyestuffs for colored effects and an acid reacting reducing agent, especially zinc formaldehyde sulfoxylate. The printing paste contains for instance a scarlet Indigosol dyestuff, dissolved in an organic solvent (monoethylether of ethylene glycol, Cellosolve, alcohol), a swelling agent, for instance thiocyanate of sodium (regarding thiocyanates as swelling agents, compare with the report on U. S. Pat. 2,436,059, AMERICAN DYESTUFF REPORTER, page 474, July 12), sodium nitrite and zinc sulfoxylate formaldehyde. The printed fabric is aged for 10-15 minutes and thereupon immersed in an acid bath where the nitrite acts as a re-oxidizing agent as usual.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,029,351 (Imp. Chem. Ind.): Benzylsulfanilic acid (salt solution) combined with a polyhydric alcohol such as diethylene glycol to facilitate printing, dyeing or padding with Indigosols.

U. S. Pat. 2,005,182 (Celanese): Discharge patterns are produced by the use of $SnCl_2$ or $TiCl_2$ in conjunction with urea or dimethylurea.

U. S. Pat. 2,193,749 (Durand & Huguenin): Protects the well known ammonium-chlorate-vanadate process for printing Indigosols.

U. S. Pat. 2,115,374 (Celanese): Acetate of cellulose is partly saponified and thereupon treated with an Indigosol dye solution. The dyestuff is absorbed in a different way by the saponified and unsaponified areas whereby patterned effects result.

U. S. Pat. 2,010,854 (Celanese): Gives a formula for obtaining dischargeable blacks on cellulose acetate by dyeing with non-diazotizable yellows, oranges and reds combined with a diazotizable amino base, yielding a navy blue. The blue dyestuff is thereafter diazotized and coupled.

Other references are:

U. S. Pat. 2,017,120 (Celanese): Tried to solve the problem of colored discharges on acetate cellulose fabrics in using zinc formaldehyde sulfoxylate in a different process. The pastes contain zinc salts of the vatted dyestuffs (thus insoluble products) instead of the usual alkaline vat pastes.

U. S. Pat. 1,981,907 (Du Pont): Describes discharges on acetate rayon, using sulfoxylate formaldehyde, zinc thiocyanate in powder form and a swelling agent such as diethylene glycol.

PAUL WENGRAF

Keratin, Reduced and Dissolved in Alkalis— Coating and Producing Fibers G, 2, 01

U. S. Pat. 2,436,156
(Du Pont, Upson, February 17, 1948)

The present method is particularly recommended for preparing fibers from keratin solutions as described here below. The process can however be applied in coating material such as fabrics or the like. It is known by studies of Speakman, Harris and other scientists that keratinous proteins can be reduced by splitting the disulfide linkages under specific conditions. By carrying out this process very carefully a clear solution may be obtained which is coagulable by an acidifying operation. The first step—reducing the keratinous substance (which may be wool, horn, waste, hooves and so on)—is carried out by treating the material in a weakly alkaline solution of thiosorbitol, thioglycolic acid or some other sulfur containing organic compound. It is essential that the wool molecule might not be damaged or strongly degraded in this step. After digesting the keratinous substance at moderate temperatures for about an hour a viscous solution results which is *precipitated and re-dissolved* while mixing it with a resin polymer such as styrene—maleic anhydride interpolymers. Ammoniacal solutions are prepared which after casting or coating give off the ammonia and leave the keratinous layer on the substratum.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,337,398 (Tootal Broadhurst): Suggests adding an aquerous dispersion of a polymerized alkylester of acrylic or methacrylic acid to a viscose solution for spinning purposes.

Earlier work, done in this field:

Keratinous solutions, suitable for forming fibers as well as for preparing permanent finishes are obtained according to U. S. Pat. 2,413,983, 1947 (L. R. Bruce)—compare abstract in AMERICAN DYESTUFF REPORTER 1947, 337—by introducing first an organic or inorganic group, for instance a sulfogroup, into the molecule and dissolving the reaction's product in thioglycolic acid. It is claimed that this solution can be dialyzed and becomes more stable after dialyzation than a thioglycolic acid solution, obtained by other methods, with non treated keratin. Alkalisulfides have by themselves a dissolving but not substantially destroying effect in reacting with keratine; according to U. S. Pat. 2,287,023 (d'Ambrosio and Corbellini) the protein material—horns, hooves, etc.—cannot be readily dissolved in alkalis. It is proposed to reduce these keratinous substances to powder form, to mix them with alkalisulfides and to keep this suspension at 15-30° C. for a relatively long time. A solution is finally obtained which has to be filtered. Here, as in the precedent cases, the mass can be used as a blend in spinning dopes of viscose and also as a coating liquid.

Parchmentizing Rayon with Sulfuric Acid—Control of Reaction G, 2, 01

Swiss Patent 246,968
(Heberlein, November 1st, 1947)

Parchmentizing of fabrics, composed from rayon threads, has some difficulties. The process does not give the same perfect results as on native cellulose material. It has been tried to get the reaction under control and to mitigate the sudden action of concentrated, chilled sulfuric acid on regenerated cellulose by adding bases such as amines, alcohols or heterocyclic bases but the effect was nevertheless not satisfactory. The method, protected by this patent, consists of subjecting rayon fabrics to a normal parchmentizing operation, for instance by passing the fabrics through sulfuric acid 48° Bé for 11 seconds at temperatures between minus and + 1° C., to rinse the goods thoroughly and to lead them thereupon for a very short time (6-10 sec.) through strong potassium lye (30° Bé). Sodium hydroxide can be used too but it has to be remembered that regenerated cellulose is very sensitive to soda lye at concentrations over 20° Bé. The inventor proposes to use here a sodium hydroxide solution of 8° Bé maximum. Working this way a uniform translucent fabric is obtained.

Reference: It has been proposed to slow down the parchmentizing action of concentrated sulfuric acid by adding aminotriazine (melamine) according to U. S. Pat. 2,299,200 (Am. Cyanamide).

Cellulose Zincate Solutions Oxidizing Agents Added G, 2, 01

Swiss Patent 244,321
(Heberlein & Co., April 1st, 1947)

Highly degraded cellulose solutions are the object of the present invention. The amount of degradation has to be well under control in order to use them for finishes and the like. It is known to dissolve cellulose in zincate solutions, as well as to degrade the molecule by oxidation. The present process combines both procedures by treating cellulose in strong alkaline (20% NaOH) zincate solutions with oxidizing agents which have to be resistant to alkalies of this concentration. Such oxidizing agents are p-toluene sulfochloramide-sodium, p- toluene sulfodichloramide (thus Aktivin and Peraktivin), persulfates and sodium hypochlorite. 25 kg. of a solution made up by dissolving 10% ZnO in 30% sodium hydroxide are mixed with a solution of 750 g. sodium persulfate in 10 L. water. Up to 7.5 kg. waste viscose cut in short pieces are stirred in. The mixture becomes spontaneously hot and has to be cooled down at room temperature. Thereupon 56.75 kg. NAOH 1% are stirred in. The slurry dissolves to a 7.5% solution which can be used for finishing purposes and diluted with water or lye as desired.

References: U. S. Pat. 2,416,998 (see AMERICAN DYESTUFF REPORTER 1947, 366) observed, seemingly at about the same time, that cellulose, pretreated with sulfuric acid and dichromate, therefore partly degraded by oxidation, was more easily soluble in zincate. U. S. Pat. 2,368,527 (Edelstein) suggests to degrade cellulose by hydrogen peroxide and to catalyse this reaction by the action of the metal walls of the vessel in which this operation is carried out, before dissolving the material in zincate.

It might be remembered that the company took out Brit. P. 581,436, describing a transparentizing process with sodium zincate (AMERICAN DYESTUFF REPORTER, 1947, 367).

Chrome Dyestuffs Printing, Paste Containing Thiosulfate, Oxygen Acceptor, etc. D, 2, 05

Swiss Patent 247,429
(Durand & Huguenin, December 1st, 1947)

In former times chrome dyestuffs could only be fixed in a steam treatment of at least 45 minutes. Progress became evident by adding carboxylic acid amides (formamide, acetamide, urea) to the printing paste. These auxiliaries accelerated the formation of the dyestuff lake and reduced the time necessary for fixing the chrome dyestuff. But still the minimum time, required for the steaming operation, was 5-8 minutes and even then some dyestuffs could not be fixed at all. According to the present invention a dyestuff composition was developed which is firmly fixed on the fiber by the standard drying process or by simply keeping the printed cloth over night before undergoing further treatment. In a few severe cases an additional short steaming treatment of 2 minutes gave a perfect result. The dyestuff composition, covered by the patent, contains a thiosulfate (generally a salt of an oxygen-sulfur-containing acid,

having somewhat reducing properties), hydroquinone or anthraquinone (as an oxygen acceptor) and one of the amides mentioned above. This composition is worked up with thickener, urea, thiosulfate and some sodium chromate giving off the chrome necessary for mordanting the dyestuff in the phase of storing or warming up the printed material.

Reference: Thioglycolic acid or other sulfur-containing organic acids are added to chrome dyestuff prints in order to speed up the fixation (see Brit. P. 453,834, I. G. Farben). It is interesting to remember the content of Brit. P. 582,089 (same Company), reported in AMERICAN DYESTUFF REPORTER, 1947, p. 395. This patent proposes to fix chromium mordant dyestuffs during the drying process by applying an emulsion of the water-in-oil-type and using ammonium thiocyanate as an acid splitting agent, while the chrome mordant is likewise added in form of neutral chromate.

Creaseproofing Textiles—Melamine Condensates, Stabilized with Amino Diphenyl G, 2, 04

Brit. P. 591,496

(Monsanto Chem. Co., August 20, 1947)

In preparing melamine-formaldehyde condensation products which are frequently used in textile finishing operations (for instance in crease-proofing processes) melamine is suspended in formaldehyde and warmed slightly until the formation of a mildly colloidal precipitate is noted in dropping a small test quantity into water. It is a difficult problem to concentrate these solutions without undue polymerization and to avoid the formation of very hard, quite insoluble resins which have to be applied subsequently to the fibrous material. The inventor found that very stable condensates, easy to concentrate, can be prepared by first condensing melamine and formaldehyde under slightly alkaline conditions (at a pH of 7.8). As soon as the reaction has started alkali is added and the mixture is further heated. Thereupon aminodiphenyl is introduced into the mixture and the reaction product of these aforementioned components is isolated by distillation. It is a clear, grindable, transparent resin, insoluble in water but soluble in furfural, furfuryl alcohol, and to a lesser extent in coal tar solvents (for instance xylene or toluene). The solubility in solvents of the furfural type is specific for these new condensates which are particularly useful as permament coating and waterproofing auxiliaries.

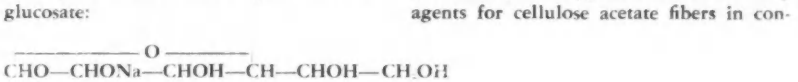
Reference: U. S. Pat. 2,409,906 seems to correspond to this publication.

Bleaching, Hypochlorite, Stabilizing with Sodium Glucosates B, 1

Brit. P. 591,537

(Lockport Cotton Batting Co., Aug. 27, 1947)

Halogen-containing bleaching agents, typically represented by sodium and calcium hypochlorite are not entirely satisfactory in bleaching processes as far as incrustating materials adhere to the cellulosic fibers, rendering them brittle and reducing the natural lustre. It has been discovered that certain organic compounds (glucosates) derived from glucosides or phosphoglucosides have the property of converting these incrustations into non-adherent suspensoids when added to the bleaching solution. They keep the incrustating substances in colloidal state during the bleaching process and therefore can easily be removed in a simple rinsing process. An example for these glucosates is the compound sodium glucosate:



Dextrose groups

This glucosate is added in very small amounts. 25 parts per one million parts of the bleaching solution are sufficient. The brightness was found to have increased about 7%, the ash content dropped in one of the examples from 0.73 to 0.51 i.e. about 30%.

This patent is apparently identical with U. S. Pat. 2,359,782 (1944).

References: Glucosides and sugar derivatives quite generally have the property of plasticizing glue or gelatine used in adhesives (for example U. S. Pat. 2,422,328, Ind. Pat. Corp.; also U. S. Pat. 2,407,001 (1946), Atlas Powder). Glucose-complex compounds are known for stabilizing oxygen-developing substances (see Ger. P. 576,962, Rieche). Thus the bleaching effect of hypochlorites might still be improved by adding glucosates.

Raising, Local Effects on Mixed Wool, Vegetable Fiber Fabrics G, 6

Brit. P. 591,708 and 591,712

(Brit. Celanese, Speakman-Crummet, Aug. 26, 1947)

These two inventions relate to the practice of raising fabrics, composed from wool mixed with cellulosic yarns or yarns of cellulosic derivatives (ethers, esters). It has been discovered that fabrics of this type treated with an agent which softens the cellulose esters or ethers show, after raising, a greater proportion of wool in the pile than corresponds proportionally to the original content of the fabrics or in other words, that the yarns softened (and therefore restored to the non-softened condition) are not as easily raised as the wool fibers. The softening agents are preferably, according to the first mentioned patent, water miscible organic solvents such as aqueous solutions of diacetone alcohol, acetone, ethyl lactate, also lower acids for instance acetic, propionic, formic acids or phenols. Good results have been obtained by using aqueous acetic acid of 40% strength or formic acid of 36% strength at 20-25° C. The fabrics are soaked for some time for about 1-2 hours in one of these solutions, then dried so that the softening agent is volatilized. Dyeing after softening but before raising is recommended as most efficient. In dyeing with a typical wool dyestuff the piles appear darker than the non-raised material, being raised in a relatively great proportion. The second patent protects particularly the application of shrinking agents for cellulose acetate fibers in connection with the present method. Interesting effects are obtained for instance by dyeing the pre-treated material with a blue acid dyestuff (Coomassie Brilliant Blue F. F. S.) and a red acetate dyestuff (1-methylamino anthraquinone) giving predominantly blue raised wool piles on a red ground.

References: Printing effects on mixed materials (acetate-viscose or acetate-wool cotton) by partly transforming the acetate portion have been described amongst others in Brit. P. 439,124 (Rhodiaceta); printing benzoyl peroxide, or in U. S. Pat. 2,002,083 (Dreyfus); printing saponifying agents. An older patent of Celanese, Brit. P. 375,313, proposes to print solvents on acetate rayon fabrics and thereby modify locally the acetate fibers. Conversion effects are obtained according to Brit. P. 387,343 (Celanese-Ellis) by cross printing standard prints on acetate rayon fabrics with ethyl lactate or the like thus increasing the dyestuff affinity in the printed areas. A similar effect is apparently obtained (although in a more complicated way) according to Brit. P. 475,906 (Imp. Chem. Ind.); raised fabrics are printed with a strong alkaline thickener and thereupon reacted with ethylene oxide or similar products changing the dyestuff affinity on the printed areas. The principal and surprising innovation of these two patents is that obviously certain chemical modifications of vegetable fibers, worked up with wool yarns, decrease their property of being attacked in customary raising operations.

TRADE NOTES • NEW PRODUCTS

• Woolen Manufacturers Meet on Research

Representatives of leading wool textile producers of the nation met at Princeton, N. J., on June 24 to review the four-year program of fundamental research into the physical and chemical characteristics of wool sponsored jointly by the American Wool Council, the International Wool Secretariat and the Textile Research Institute.

The plan and purposes of the program were presented before a meeting of wool manufacturing members of the Textile Research Institute by Dr. J. H. Dillon, the Institute's Director of Research. During a discussion by those attending, it was pointed out that the research findings undoubtedly would have application to many phases of wool textile manufacturing beyond the immediate purposes set forth.

The research program was first discussed by the American Wool Council and the National Wool Growers Association with representatives of the International Wool Secretariat in January last.

Since that time, conferences both in the United States and in London—including a visit to America by Dr. E. G. H. Carter, Director of Scientific Research of the International Wool Secretariat—have resulted in formulating plans for an international research program.

The research studies, to be carried out in the laboratories of the Textile Research Institute and the Textile Foundation at Princeton, propose to examine the basic physical and chemical properties and morphology of wool fibers of various types and grades and to determine the relationship of these fundamental fiber characteristics to spinning quality, yarn character and the properties of fabrics produced from them. All results of the research will be published in recognized scientific journals.

The need for such a program at the present time is pointed up by the world scarcity of fine grade wools and a demand for them that is the greatest in history. Wool consumption in the United States has doubled the prewar average; world consumption is up 10 to 15 per cent. Meanwhile, production of the finer grades of wool throughout the world has declined 40 per cent since 1942.

In addition to participating in the discussion held, those attending toured the laboratories of the Textile Research Institute and, during the afternoon, heard talks by Roland Barker, who discussed "A New Approach to Fiber Studies," and by Harris Burte, who discussed "Mechanical Properties of Wool."

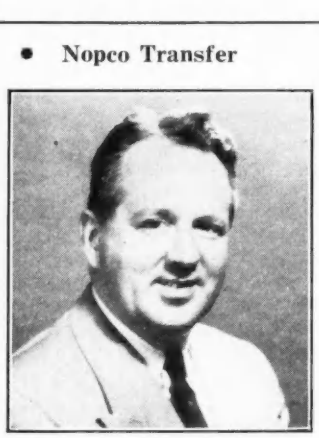
Those attending the session were:

Alex Morrison, of the American Woolen Company; T. A. Griede, of Wyandotte Worsted Mills; John C. Folke, of A. M. Karagheusian, Inc.; Edward J. Cogovan, of Mohawk Carpet Mills, Inc.; R. M. Ingham, Jr., of Deering, Milliken & Co., Inc.; John H. Abt, of Deering, Milliken & Co., Inc.; W. W. Bayley, of Sidney Blumenthal & Co.; R. W. Canovan, of Sidney Blumenthal & Co.; J. C. Van Nest, of Goodall-Sanford, Inc.; J. B. Goldberg, of J. P. Stevens, Inc.; Harold S. Dahlberg, of Kenwood Mills; A. G. Ashcroft, of Alexander Smith & Sons Carpet Co.; F. R. Haigh, of Botany Mills, Inc.; Fred Noechel, of Botany Mills, Inc.; James Wilson, of the Forstmann Woolen Company; Kenneth Wilson, of the Forstmann Woolen Co.; and Werner von Bergen, of the Forstmann Woolen Co.

Among others present were:

D. B. MacMaster, Julian Jacobs and John C. Whitwell, of the Textile Research Institute; and John K. Murphy, of the American Wool Council.

• Nopco Transfer



Transfer of Joseph E. Connell (above) from the New England territory to the West Coast has just been announced by Nopco Chemical Company, Harrison, New Jersey.

Mr. Connell has been with the Company for more than 12 years and has wide experience with company products and their application. Prior to acting as sales representative for the company in New England, he served in both the home and Boston offices.

Mr. Connell's new territory will include Washington, Oregon and Northern California where he will be responsible for sales on the company's line of industrial processing chemicals and the metallic soaps of its subsidiary, Metasap Chemical Company. Effective date of the transfer is September 1.

• Opening Roll Unit

Birch Brothers, Inc., of Somerville, Mass., have recently placed on the market a newly designed Adjustable Spiral Opening Roll Unit. This unit is designed to remove wrinkles and doubled selvedges from all types of fabric as the fabrics are being processed in the open width. Some of the applications are on padders, mangles, mercerizing ranges, open-width dyeing machines, printing machines, etc.

The rolls are made of stainless steel with cut threads, the stay rods are also of stainless steel. The machine is designed so that any desired degree of contact of the rolls with the cloth may be obtained. The machine is fitted with cut gears, one of each pair being of fiber for quiet operation. The bearings for the spiral rolls are self-sealed ball bearings.

• Test for Washable Woolens

A first-hand report of the first comprehensive consumer road test for washable woolen fabrics was given at Everett, Mass. recently by a police chief whose entire force of 300 officers has served as "guinea pigs" for the experiment for more than a year. The report was given by Police Chief Raymond P. Gallagher of Springfield, Mass. Mr. Gallagher stated that "after more than a year's wear reaction of his entire force toward the shirts was most complimentary." His men were outfitted in the Spring of 1947 with 900 shirts which had been treated with Monsanto's Resloom W.

"Virtually every man has worn the shirts winter and summer," the Police Chief continued. "They have been subjected to every kind of laundering and cleaning condition, yet they have stood up without any perceptible shrinkage. They should be good for another two years. A solitary complaint was received and that was from a policeman who said his wife had hand-washed his shirts. In light of the other reports, we do not understand this."

The experiment was undertaken by Monsanto to test under the most rigid sort of conditions the actual behavior of Resloom W, a melamine resin formula. Police were selected to sample the garments because of the nature of their duties. Only caution given the men when the shirts were issued was not to boil them. For the first four months, the of-

ficers kept a written record of each washing or cleaning. At the end of that period Zeroes marked their answers to questions of whether the shirts had shrunk "badly" or "noticeably." Only 33 noted a "slight" shrinkage.

To the question of handle, 78 reported no difference from other flannel shirts, and 114 described them as "feeling" better than most flannel shirts. Only one recorded that the fabric felt "harsh and rough." In the category of price, 75 registered a willingness to pay a $2.50 premium price for similar washable-woolen shirts. Other answers ranged from $8 to $16.

A second check was made by a Monsanto representative a few weeks ago. Twenty-two officers and wives, selected at random from the original list, were questioned. The pattern of answers was generally the same as that disclosed in the original questionnaire.

According to the Monsanto announcement, laundering methods were varied, ranging from hand-washing to automatic washing machines.

The Monsanto announcement said that despite original instructions, approximately one-half of the wearers had persisted in hand-washing methods in the belief that life of the fabric would be prolonged. After initial washings, it was pointed out, there seemed to be little or no apprehension about shrinkage but that most of the wives felt that the shirts would last longer if the garments were washed by hand.

• Welch, Holme & Clark Anniversary

Some 55 friends and employees of Welch, Holme & Clark, one of the oldest chemical supply houses in the country, honored company president Elias D. Stults at a luncheon in the Le Perroquet Suite of the Waldorf-Astoria July 30, in celebration of Mr. Stults' 50th year with the firm. He was presented with an engraved silver pitcher for his home and a framed engrossed scroll for his office.

Mr. Stults was 16 years old when he applied for the position of office boy at Welch, Holme & Clark's old water-front warehouse at 383 West Street in 1898. A few years later Stults was promoted to salesman. Then in 1922 he was elected to the board of directors, serving as secretary of the corporation. In 1928 he acquired the vice-presidency, and in 1929 he was elected to his present position—that of president. He is an active member of the Oil Trade Association of New Jersey and of New York, the New York Board of Trade, the Chemists Club, and the Mayor's committee for Greater New York's Golden Jubilee. He is a past Master Mason and a former superintendent of Sunday Schools in his home town of Summit, New Jersey.

Elias D. Stults

This year also marks the 110th anniversary of Welch, Holme & Clark, Co., having been founded in 1838 by Oliver Loveland. Under the name O. Loveland, Son & Co., the firm dealt mostly in lime, cement, and building materials. It came to serve the soap industry in 1858 when the name Welch became associated with it. In those days soap makers had to use lime in causticizing soda ash. P. A. Welch, Mr. Loveland's son-in-law and star salesman, recognized the convenience and advantages of supplying them with other raw materials used in the making of soap, and the company soon became one of the principal suppliers of raw materials to the soap industry.

Among the company's treasured papers are several orders dating back to 1875 when Caustic Soda was selling for $4.60 and payment was in gold.

In spite of its many changes in ownership and personnel throughout the years, Welch, Holme & Clark remained a family affair. When the Lovelands retired, Mr. Welch remained sole member. Feeling the need in the firm of a man who was well-acquainted with soap makers, he asked the young bookkeeper, Henry Holme (whose father was a retired soapmaker) to join. He engaged M. E. Clark, a native New Yorker to give it local color. Together they borrowed money, bought out Loveland's share, and changed the company name to P. A. Welch & Co.

WELCH, HOLME & CLARK.
COMMISSION MERCHANTS,
AND DEALERS IN
SODA ASH — POTASH — ROSIN — TALLOW
CAUSTIC SODA — PEARLASH — SPTS TURPENTINE — LARD
SAL SODA — CHINA CLAY — TAR — GREASE
BLEACHING POWDER — PALM OIL — SILEX — STEARINE
BI CARB SODA — COCOANUT OIL — BONE — BONE BLACK
COTTON SEED OIL, ESSENTIAL OILS &c
Nos. 381, 383 & 385 WEST STREET,
or 141, 143, 145, 147 & 149 Barrow Street,
NEW YORK.

An Old W. H. & C. Business Card (Circa 1870)

In 1870 the name was changed to the present, Welch, Holme & Clark; and Mr. Holme's retired father was also added to the partnership.

In the years that followed, A. M. Sherrill and his son, Howard, became partners and presidents. Mr. Clark succeeded then as head of the firm until 1929 when Elias D. Stults was elected as the seventh president. During these years the company was recording an interesting history. It was incorporated by Mr. Sherrill in the state of New Jersey and by Mr. Clark in New York. It survived the effects of panic and the Civil War, two world wars and four depressions. It out-grew all its warehouses, moving from one to another until it now occupies a large building at 439 West Street, New York City, as well as a warehouse in Newark, New Jersey.

• Research Conference

Research and management officials of most of the major carpet manufacturers, together with representatives of a number of other textile firms, recently attended a research conference sponsored by Alexander Smith & Sons Carpet Company and held in the laboratories of the company's mill here. The conference was addressed by Dr. John H. Dillon, Director of Research for the Textile Research Institute Laboratories at Princeton, New Jersey, who described the work of the Institute and its importance to the whole textile industry.

Dr. Dillon explained that the Institute engages in fundamental textile research for the common benefit of 150 subscribing members, and emphasized that this work serves as a basis for applied research carried out by the members in solving their individual problems. He further explained that in addition to the continuing program, the Institute is carrying out special projects for the rayon industry and government agencies such as the Quartermaster Corps and the Office of Naval Research.

Dr. Dillon also discussed the four-year research program recently started by the Textile Institute in conjunction with the International Wool Secretariat and the National Wool Council. This project, for which almost one-third of a million dollars has been subscribed, is designed to carry out fundamental research on the relationship between wool structure and its processing and product properties. One of the major aims of this work will be to make comparative studies of the physical and chemical characteristics of the various grades of wool in an attempt to find ways to relieve the currently increasing shortage of apparel wools by means of modifying the characteristics of some of the intermediate grades.

AMONG THOSE PRESENT AT ALEXANDER SMITH RESEARCH CONFERENCE: (left to right)—G. E. Schulz, President of Nye-Wait Company; M. L. Griggs, Vice President of Alexander Smith; Dr. John H. Dillon, Director of Research at the Textile Research Institute; G. E. Clitter, Vice President of A. M. Karagheusian; A. G. Ashcroft, Alexander Smith Research Director.

A. G. Ashcroft, Director of Research for Alexander Smith and Vice President of the Textile Research Institute, joined with Dr. Dillon in emphasizing the benefits to be derived from membership in the Insttitue. It was pointed out that while all the research findings are ultimately published, members have the advantage of free access to the work as it is being carried out, and are entitled to membership on the advisory committee of any special project to which they subscribe.

In addition to taking part in the conference, those present were afforded the opportunity to view the Alexander Smith laboratories which have recently undergone extensive remodeling as part of the company's post-war modernization and improvement program.

• New Liquid Desizer

Rohm & Haas Company announces a new liquid diastatic enzyme concentrate for textile design. According to the manufacturer, this new product, named Rhozyme LA, combines the recognized economy of a liquid enzyme with unusual stability at high temperatures, affording thorough and uniform desizing in the fastest possible time.

Rhozyme LA is the latest addition to the series of textile desizing agents supplied by Rohm & Haas Company under the name "Rhozyme." The others are dry, stable, powders, the most widely used being Rhozyme DX, a concentrated diastatic enzyme powder, and Rhozyme PF, a concentrated proteolytic enzyme powder.

• Booklet on Organic Chemicals

A new and revised edition of the booklet, "Physical Properties of Synthetic Organic Chemicals," has just been issued by Carbide and Carbon Chemicals Corporation, a Unit of Union Carbide and Carbon Corporation. This 12-page booklet has been designed as a condensed guide for users of organic chemicals. It contains data on applications and physical properties for more than 185 synthetic organic chemicals. The material is presented in tabular form for ready and easy reference. Copies may be obtained without charge by writing to Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York 17, N. Y. Ask for Form 6136.

• American Aniline Appointment

The addition of Robert W. Delaney to its Philadelphia sales staff has been announced at the main office of American Aniline Products, Inc., by G. L. Armour, executive Vice-President.

Mr. Delaney will work out of the Philadelphia office of American Aniline Products, Inc., covering Southern Pennsylvania, Delaware and Maryland.

• New Exact Weight Scale Models

The Exact Weight Scale Co., Columbus 12, Ohio, announces publication of a bulletin (Form 3208) describing six new models of scales. These are 75-pound capacity scales and there are three Shadograph models (electrical) and three Exact Weight models (mechanical).

The end-tower design permits high speed in delicate weighing operations. It is stated that three platter designs in each scale type, plus the dust cover (which does not rest on the weight platter), provide an unprecedented selection of models.

The Shadograph models, featuring the longer travel of shadow indication for each unit of weight, are said to be capable of very accurate readings to unusually strict tolerance. A parallax reading is impossible.

The mechanical models are also said to be accurate and fast. Although not a substitute for the Shadograph type equipment, it is stated that they meet the high standard of weighing accuracy established by the thousands of Exact Weight mechanical scales now in service.

Copies of the bulletin are available upon request.

• p-Chlorobenzotrifluoride

p-Chlorobenzotrifluoride (p-chlorotrifluoromethylbenzene) has recently been introduced in pilot plant quantities by the Hooker Electrochemical Company. The compound is of interest for its potential applications as an intermediate in the preparation of various chemicals and dyestuffs, as well as for possible use as a special solvent and dielectric fluid.

p-Chlorobenzotrifluoride is a colorless aromatic liquid which is characterized by the CF_3 group. This radical is generally stable to light, heat and chemical reaction. Its distillation range is 138° to 141.5° C; freezing point is —36° C; and its specific gravity at 15.5° C. is 1.353.

Technical Data Sheet No. 362 describes the product in more detail. Samples and literature may be obtained by writing on your business letterhead to the Hooker Electrochemical Company, Niagara Falls, New York.

OBITUARY

JOSEPH J. SOLODYNA

JOSEPH J. SOLODYNA, Superintendent of Dyeing at the Putnam (Conn.) Woolen Company, died recently at the Neurological Institute in New York after a sudden illness. He was 48 years old.

Mr. Solodyna was a graduate of the Philadelphia Textile Institute and was formerly Superintendent of Dyeing at the Schilton Woolen Company, Webster, Mass. He later was employed by a number of other mills before taking the position he held at the time of his death.

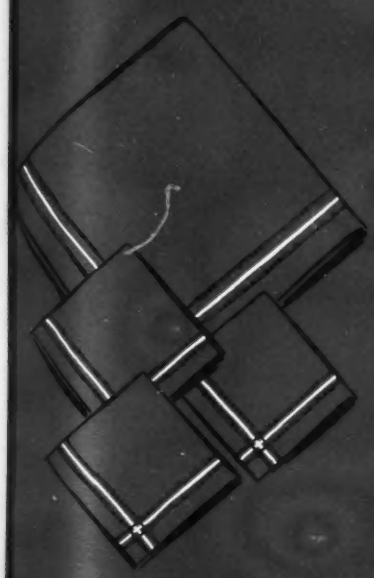
He was a member of the AATCC and of the Putnam Lodge of Elks.

A Newcomer To The Calco Line

CALCONYL DOUBLE SOLUTIONS

Stabilized Azoic Dyes

To its extensive line of textile dyes, Calco has now added an adequate range of reds and yellows for stabilized azoic printing. These CALCONYL® DOUBLE SOLUTIONS are highly recommended for cotton printing to produce full shades with good fastness to light, washing, dry cleaning, hot pressing and perspiration. They are especially recommended for printing on cotton dress goods, table cloths, handkerchiefs, towels and similar applications.



Since CALCONYL DOUBLE SOLUTIONS represent a very concentrated form of solution, they require less storage space and offer greater ease of handling and a HIGH DEGREE OF STABILITY IN STORAGE. Under normal plant conditions CALCONYL DOUBLE SOLUTIONS will not precipitate or separate on long standing.

Your Calco representative will be glad to recommend the particular type of dye that will most efficiently meet your specific needs.

CALCONYL DOUBLE SOLUTIONS

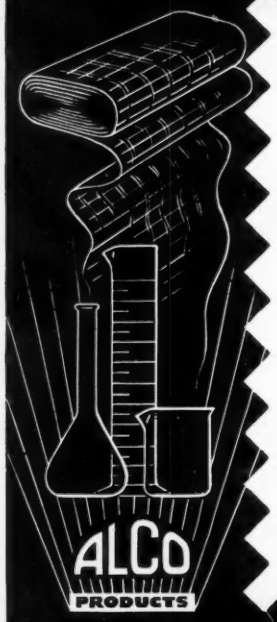
Calconyl Scarlet R Double Solution
Calconyl Red G Double Solution
Calconyl Red R Double Solution
Calconyl Yellow 2GR Double Solution
Calconyl Yellow G Double Solution
Calconyl Golden Yellow R Double Solution

*Reg. U. S. Pat. Off.

Calco

AMERICAN Cyanamid COMPANY

CALCO CHEMICAL DIVISION
DYESTUFFS DEPARTMENT
BOUND BROOK, NEW JERSEY



VULCANOLS

for sizing and finishing

VULCANOLS have proven to be efficient for the production of durable, flexible finishes on tickings, shade cloths, book cloths, baggings, pile fabrics, hair cloths, label cloths and carpets.

for starch sizing mixes

VULCANOLS are economical plasticizers and binders providing finishes of increased resistance to mechanical removal.

ALCO OIL & CHEMICAL CORPORATION
TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

SOUTHERN DISTRIBUTORS
WICA COMPANY INC.
CHARLOTTE, N.C.

Manufacturers of

SYNTHETIC TEXTILE CHEMICALS

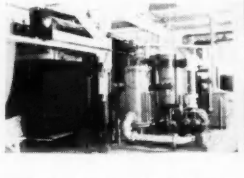
CLOVER CHEMICAL CO.

EAST PROVIDENCE
RHODE ISLAND

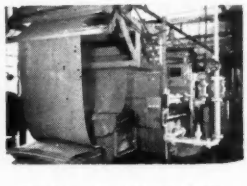
The Fleet Line

DERBY DRY CLEANER

***Versatility* Is A Leading Characteristic**



Installation in a New England mill making women's woolens.



Installation in a Maryland mill making cassimeres, flannels, tweeds and shetlands.

Fabrics now being handled by this machine include woolens, worsteds, rayon mixtures and mohair plushes. Although it involves a considerable investment and volume production, many machines are now in use. Constant improvement in design, greatly decreased solvent consumption and tremendous operating economies account for its popularity.

ADVANTAGES

1. Removal of tar, paint, asphalt, creosote, pigment, chalk, etc.
2. Almost any type of wool oil can be used—even cheap mineral oils.
3. Tremendous savings in oil, through reclamation.
4. Elimination of steam contamination from oil residue.
5. Reduces burling and mending.
6. Great reduction in perching.
7. Minimum oil content in the finishing room.
8. Scouring usually eliminated.
9. Little or no soap required.
10. Big saving in hot water.
11. Possibilities in acid fulling of Derby Dry Cleaned fabrics.
12. Reduction in redyes and seconds.

RIGGS AND LOMBARD
INCORPORATED

FOOT OF SUFFOLK ST., LOWELL, MASS.

ACID ALIZARINE BLUE B — Pr. 93

ALIZACHROME BLUE BLACK B — C.I. 1085

recommended for

ARMY and AIR CORPS DRESS UNIFORMS

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Shepard Chemical Corporation
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CHEMICALS
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SHEPARD CHEMICAL
CORPORATION
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FOR PERFECT NYLON FINISH

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RICHMOND OIL, SOAP & CHEMICAL CO., Inc.
1041-43 FRANKFORD AVE., PHILADELPHIA 25, PA.

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Our 150TH year

Logwood, the universal dyestuff, has met all demands of perfection down through the years.

QUALITY OF SHADE
PERMANENCE ECONOMY

Write for approved methods of application

AMERICAN DYEWOOD CO.
22 EAST 40TH STREET NEW YORK 16, N. Y.

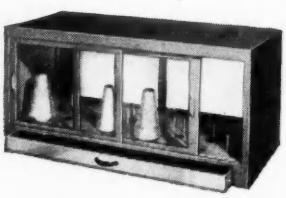
LOGWOOD
for the
Finest Blacks

BRANCHES: BOSTON • PHILADELPHIA • CHICAGO

CANADIAN REPRESENTATIVES: CANADA COLORS & CHEMICALS, LTD., TORONTO & MONTREAL

ANILINE DIVISION: NEW YORK COLOR & CHEMICAL CO. BELLEVILLE, N. J.

...Let these Amon moistening boxes simplify your yarn humidifying and storage problems



You can be sure of these important advantages when you use moistening boxes made by Joseph Amon, Inc., of Rahway, N. J. Your yarns will never be damaged by rust stains...there will be less danger of tangling during moisturizing and storage...you will get controllable humidification.

The metal of these improved moistening boxes *can't* rust. It's solid MONEL*... a tough, rustproof, corrosion-resistant INCO Nickel Alloy. There's no coating to peel or wear away. A minimum amount of attention is all that is needed to keep MONEL bright and shining, *year after year.*

The carefully-planned interior layout of bobbin pins minimizes the danger of tangling, and makes the box excellent for storing dry yarns, as well as for moistening. The large, easy-to-fill water reservoir allows convenient control of humidification. And in addition, the relatively great evaporating area helps to speed moisturizing and insures thorough penetration.

The box illustrated was designed especially for leggers, and measures 34" long x 15" wide x 16" high. Other sizes are available such as for footers, and single unit machines.

For prices and further information, write to Joseph Amon, Inc., Rahway, N. J.

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE INCO TRADE MARK

MONEL...for Minimum Maintenance

LeaTex

The name that means leadership in

CHEMICAL SPECIALTIES

for the TEXTILE INDUSTRY

"Always Reliable"

LEATEX CHEMICAL COMPANY
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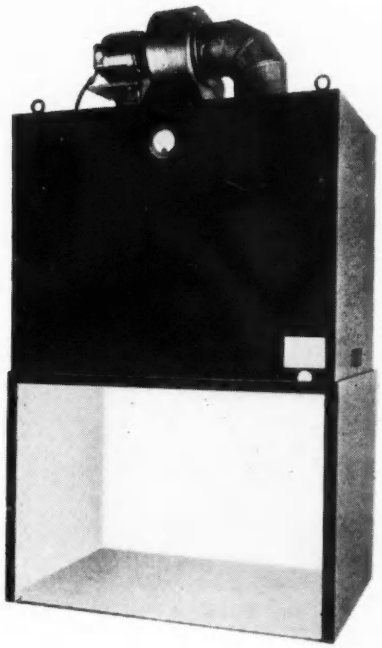
Only **Macbeth** *Color Matching Skylights Give You:*

- **ACCURACY: A match made under a Macbeth Skylight will stand up anywhere, under any light.**
- **RELIABILITY: Ready 24 hours a day, rain or shine. Maintenance negligible.**
  LARGE AREA OF ILLUMINATION: Macbeth Skylight may be used in any combination to cover any desired area.
- **WORLD-WIDE ACCEPTANCE: Macbeth Skylights are accepted everywhere as the standard, recommended color matching light source.**
- **LONG LIFE: Macbeth Skylights require no maintenance except for replacement of readily obtainable, inexpensive, standard incandescent lamps after every 1,000 hours use.**



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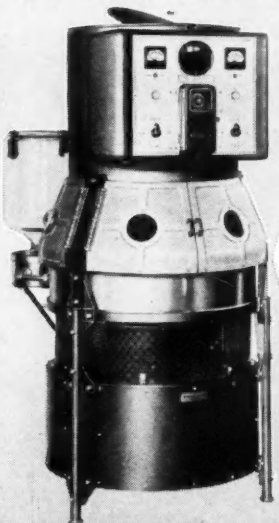
HYDROSOLS
. . . detergents penetrating agents

★ **ANILINE COLORS and DYESTUFFS**

★ **PEROXIDE of HYDROGEN and CHEMICALS**

Peuchot COLOR and CHEMICAL COMPANY
206 WATER STREET • NEW YORK 7, N. Y.

FADE-OMETER
for accelerated color fading



• Originated and made solely by Atlas. Used all over the world and accepted as the standard color testing machine by the textile industry for over a quarter of a century.

Specimens are rotated around the Atlas Enclosed Violet Carbon Arc—the closest approach to natural sunlight. Temperature automatically controlled. No loss of light intensity of arc during life of machine.

ATLAS ELECTRIC DEVICES CO., 361 W. Superior Street, Chicago, Ill.

ATLAS-OMETERS
WEATHER-OMETER ★ LAUNDER-OMETER ★ FADE-OMETER

COMMONWEALTH
COLOR & CHEMICAL CO.

More than forty years' experience in the manufacture of Chemical Specialties, Dyestuffs and Dyewoods for the Textile and Allied Trades . . .

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QUALITY RICHMOND PRODUCTS

ROSOPEN
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PACKAGE DYEING

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Better Penetration
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"TITAN for QUALITY"
DYES, DETERGENTS and TEXTILE SPECIALTIES
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The Impossible is "that" which we have not yet tried to do

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INCORPORATED
MILL ROAD and WAYNE STREET
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Representatives in: HINSDALE, N. H., KNOXVILLE, TENN.

You can't afford to neglect the advantage of

pleasant odors

Give your fabrics the added merchandising appeal of odor treatment with

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a group of deodorants and reodorants especially blended for use in fabrics. Texodors are:

economical, effective, easy-to-use, tenacious

Send for Sindar Technical Bulletin 48-2 for detailed description of this group of odors.

SINDAR *Corporation*

Industrial Aromatics and Chemicals

330 West 42nd Street, New York 18, N. Y.

Branches: Philadelphia, Boston, Cincinnati, Detroit, Chicago, Seattle, Los Angeles, Montreal, Toronto

*Texodor Reg. U. S. Pat. Off.

Ten ways to use the Gurley Permeometer*

Here's the versatile instrument for quickly and accurately measuring air permeability of fabrics which permit passage of from 1 to 400 cubic feet of air per square foot area at a pressure drop of 0.5" of water. Write for Bulletin No. 1600. W. & L. E. Gurley, 512 Fulton, Troy, N. Y.

GURLEY

Scientific Instrument Makers Since 1845

*Conforms to ASTM "Tent. Meth. of Testing for Air Permeability of Text. Fabrics" D737-43T.

Use the Gurley Permeometer for measuring:

1. *Wind-proofness* of cloth.
2. *Quality* of filter cloth.
3. *Use requirement* of cloth intended to resist or pass air.
4. *Water-resistant* properties.
5. *Coolness* or *warmth* of clothing material.
6. *Construction* of cloth.
7. *Penetration* into cloth of various coatings.
8. *Retention of fillers, starch and sizing* in cloth after laundering or cleaning.
9. *Compactness, nap* or *fiber arrangement* in cloth after fulling, washing, sizing or other treatments.
10. *Amount of wear* after abrasion tests.

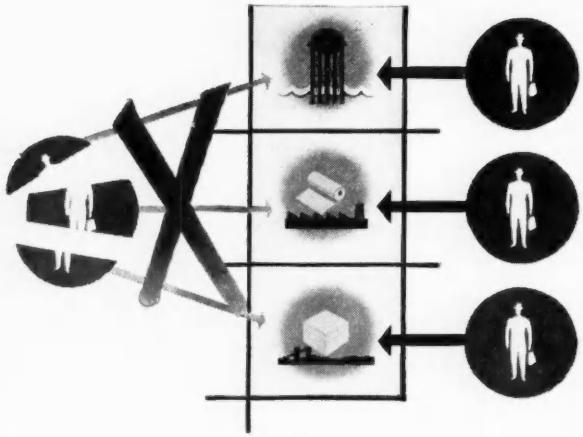
We Carry Full Stocks

Acetate Colors
Fugitive Tints
Direct Colors
Fast Color Bases and Salts
ANDOTEX* Pigment Printing Colors for Textiles**

* Reg. U. S. Pat. Off.

** Southern Representatives

BLACKMAN-UHLER CO., INC.
Spartanburg, S.C.



WHY THIS TECHNICAL SERVICE IS DIFFERENT...

Solvay Technical Service is organized on an "Industry-Wise" system . . . with Technical Service men who have spent their entire careers specializing in individual industries. The result—each man knows his industry and its problems more intimately; he can offer sound advice and practical help.

Our textile specialist is thoroughly familiar with all chemicals utilized in textile manufacturing processes. But though many of the same chemicals are used in the paper, water or other industries, our textile specialist is not called in on their problems . . . because *his* entire experience is concentrated on textile operations. The paper, water and other industries are covered by SOLVAY TECHNICAL SERVICE men who are experts in their respective fie!

When you come across a production-snagging technical situation involving alkalies or associated products in your plants . . . why not call SOLVAY Industry-Wise TECHNICAL SERVICE for help? The strictest confidence is assured. And remember—SOLVAY is backed by *sixty-seven years* of technical experience!

SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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BRANCH SALES OFFICES:
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Detroit • Houston • New Orleans • New York
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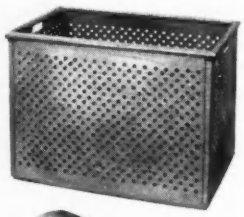
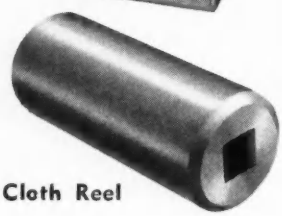
Industry-Wise
SOLVAY Technical Service
Specialists in Specific Industries

CUT COSTS WITH *Stainless Steel*



Doffing Boxes and Dye Beck Reels



Cloth Reel

Separators

TEXTILE, dyeing and finishing plants can cut deeply into operational costs by replacing ordinary metal parts with stainless steel. Stainless steel is particularly effective in preventing metallic contamination or to keep colors running true in successive runs. Reduced repairs, expense of frequent changes and adjustments, resistance to corrosion . . . soon repays initial costs.

Whether your requirements be large tanks or small separators, stainless or carbon steel . . . *Truitt will fabricate it for you.* Refer your specific needs to us . . . our engineering services are available to you without obligation.

TRUITT
MANUFACTURING COMPANY
• GREENSBORO, NORTH CAROLINA •
Fabricators of Solid Stainless Steel and Stainless-Clad Tanks • Dyeing Vats • Washing Tanks • Steam Drums • Storage Tanks for Acids and Alkalis • Mechanical Agitators • Separators • Stainless Steel Trucks • And Many Other Stainless Steel Products.

"Here's What We Want in a Dyebox,"

said Textile Dyers

1. Less time for loading, heating, lacing, doffing, cleaning.
2. Greater saving of steam and water.
3. Production of cleaner, higher quality work.

And Here's the Box We Designed

As specialists in fabricating stainless steel textile equipment, we present this new dyebox for quality dyeing. It assures all the time and money savings that dyers demand in new equipment — all the convenience of an open type box combined with the advantages of a fully enclosed box.

The NEW BLICKMAN DYEBOX

Stainless Steel and Fully Enclosed

Write for further information

S. BLICKMAN, INC.

8 GREGORY AVENUE • WEEHAWKEN, N. J.

Manufacturers of stainless steel textile equipment, dye boxes, linings, cylinders, dry cans, rolls, hoods, tanks

Close-up shows one of the three Micromax pH Recorders used by Arkwright Corp., Fall River, Mass., in the filter plant Finishing Division. Electrode Unit is located directly below Recorder. pH is recorded: (1) as raw water comes into the filter plant, (2) just after alum and filters and (3) at the clear well.

MICROMAX pH RECORDERS Help Treat Water At Textile Plant

Starting with raw water which varies from 5 to 9 pH, Arkwright had for years been treating to a value slightly above 7. But never before had treatment operated so easily and efficiently as it has since the Micromax Recorders were installed. Instruments are fully automatic; record in great detail across their 2-12 pH range. They operate alarms if pH exceeds present limits.

L&N instruments can be equipped to provide any desired type of automatic pH control, from simple on-off to fully proportioning. The latter is rapidly coming into wide use because it meets every change in acidity or alkalinity of the liquid with a strictly proportional change in the amount of chemical supplied. Because of the extreme accuracy of this balance, pH is held within entirely new limits, and full advantage is taken of the relationship between quality of water or other product, and control of acidity.

If you have a pH recording problem and will outline it, an L&N engineer will be glad to help select equipment to meet your need.

LEEDS & NORTHRUP COMPANY, 4965 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

Jrl. Ad N-96-701 (2e)

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery wanted or for sale—the rate is $7.50 per column inch or less per insertion.

TEXTILE CHEMIST WANTED: By long established dyestuff company to help develop and promote line of auxiliary products. Must have thorough technical background and practical application experience. Give complete resumé in first letter. Write Box No. 479.

TEXTILE CHEMIST

Progressive New England Distributor is seeking assistant chief chemist. One familiar with all phases of dyeing, especially unions. Mill experience desirable. Should also have knowledge of textile auxiliaries. State age, experience, education and salary expected. Our employees are familiar with this advertisement. All replies treated confidentially.

Write Box No. 476

TECHNICAL SALES REPRESENTATIVE: Wanted by well-established sizing specialists to help develop line of textile auxiliaries and finishes. Require: young man, at least 5 to 10 years' experience in wet processing and finishing, good sales personality. Good salary for right man, excellent future. Southeast. Write Box 344.

TEXTILE CHEMIST: Well established manufacturer NYC area seeking textile chemist with extensive knowledge and experience in manufacture and development of textile auxiliaries. Knowledge of dyeing and finishing preferable. Excellent prospects for right man. Write Box No. 420.

POSITION WANTED: New England preferred. Dyeing, printing and finishing superintendent seeks connection with reliable concern. 18 years experience in bleaching, dyeing and printing and finishing cotton and rayons. Textile School Graduate. Write Box No. 465.

WANTED: Recent textile school graduate majoring chemistry. Location Chicago area. Write Box 483.

WANTED ACETATE TRICOT DYER: By Eastern Pennsylvania Dye Plant. Excellent salary and prospects. Production 50,000 lbs. weekly. Write Box No. 488.

WANTED: Senior and Junior textile machinery salesmen for top rated concern. Both positions require men potentially capable of highest earnings. Experience in dyeing and finishing operations would be valuable. Reply, giving age, full information on education, experience, age, etc. Write Box No. 484.

WANTED: Technical Sales Agents by basic chemical manufacturers with over twenty years' experience in textile field. Write, giving experience in wet processing and finishing. If you have the contacts, we will furnish the products, research facilities and advertising support. Write Box No. 485.

POSITION WANTED: College graduate, 37 years of age, excellent health, free to travel to any foreign country on small salary and commission basis. Experience, operated Roller Print machine for 6 years; Laboratory experience 2 years; supervised cotton piece goods jigg dyehouse for 2 years; sold heavy and fine chemicals for 2 years; technical salesman selling resin bonded pigments for Interchemical Corp. for over 2 years. Write Box No. 486.

WANTED: Experienced Dyer and Bleacher on tubular knitted cotton & rayon fabrics. Must be able to take complete charge of daily production of 15 thousand pounds. Location, New Jersey. State qualifications and salary. Write Box No. 487.

POSITION WANTED: Alert and aggressive supervisor of dye testing laboratory with sales experience and wide knowledge of textiles desires sales job. Post-graduate work in South American languages. Write Box No. 481.

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ARE RESTRICTED TO

HELP WANTED — POSITIONS WANTED

MACHINERY (wanted or for sale)

OTHER TYPE COPY WILL NOT BE ACCEPTED.

American Dyestuff Reporter

BECCO HYDROGEN PEROXIDE

Make full use of

BECCO TECHNICAL CONSULTATION

Becco technical engineers have a wealth of knowledge and practical experience to bring to your bleaching requirements. Becco laboratories have accumulated a large amount of valuable data applicable to your problems.

Let this Becco service assist you in producing higher quality, lower cost, uniform bleaching of all fibres by all methods — including continuous bleaching. Write or call—at no obligation.

BECCO SALES CORPORATION

AGENTS FOR BUFFALO ELECTRO-CHEMICAL COMPANY, INC.

BUFFALO 7, NEW YORK

New York · Boston · Philadelphia · Chicago · Charlotte

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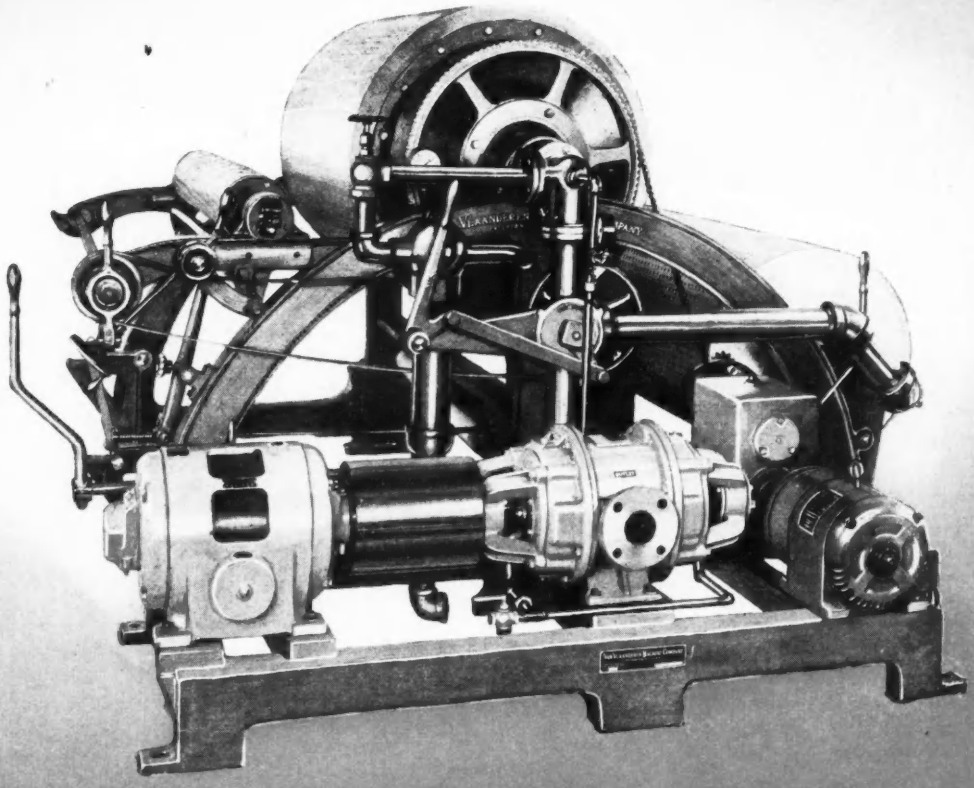

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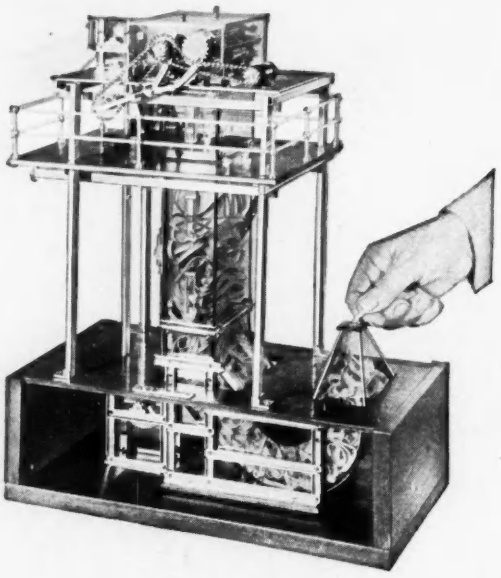

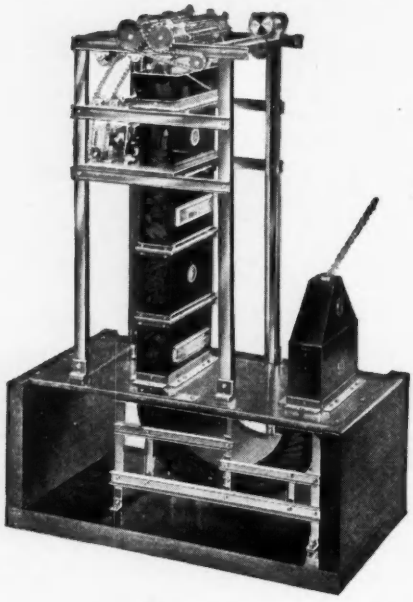

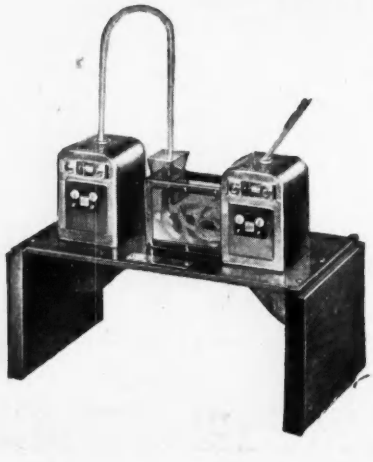

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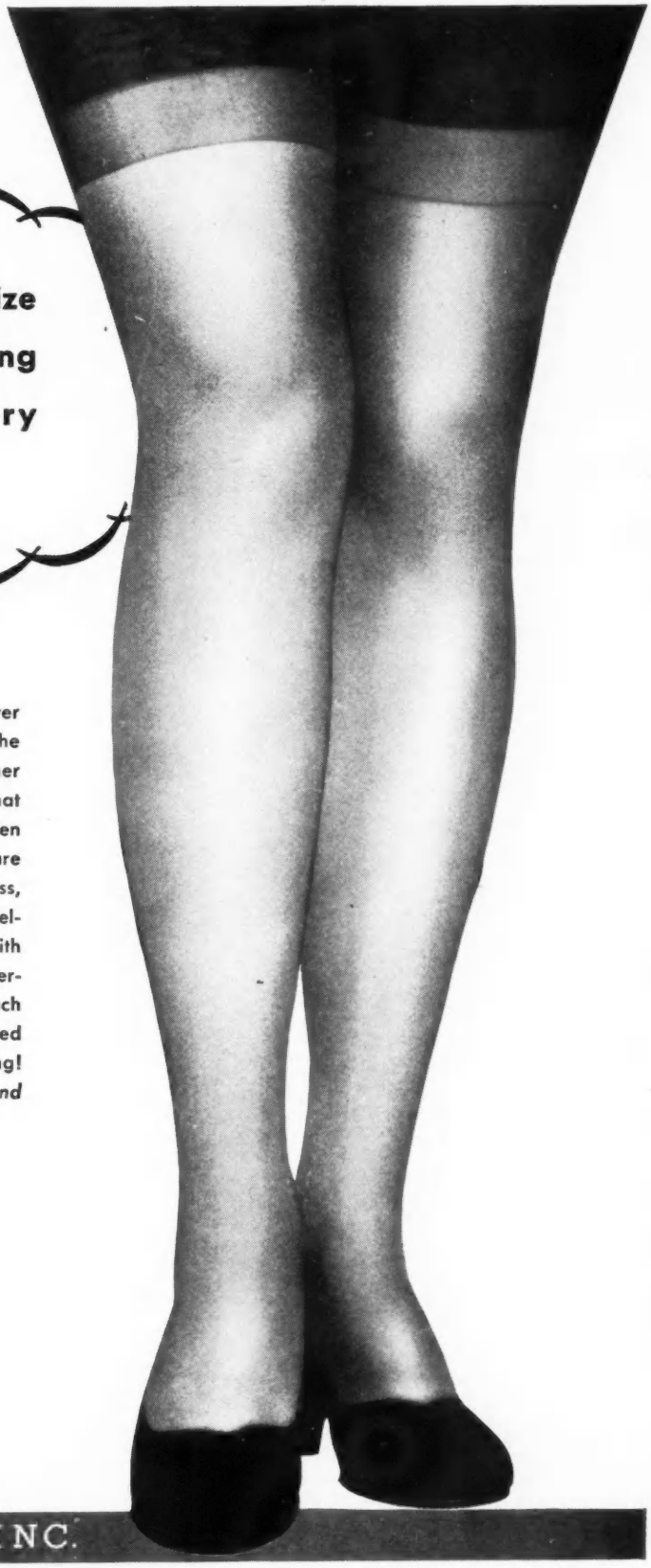

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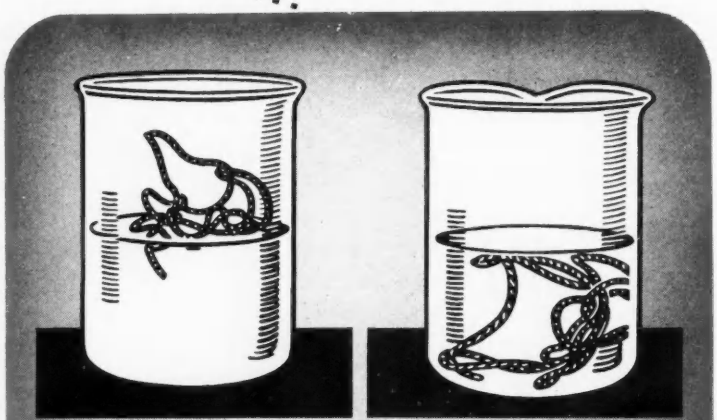

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